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ABSTRACT

This competency-based curriculum is intended to help teachers of prevocational career exploration courses in West Virginia to present information about marine/fresh water occupations. The document is organized into five units: fisheries, life sciences, marine life cultivation, research, and water vehicle operation. Each unit consists of five to 15 lesson plans, each on various occupations in those occupational clusters. In addition, there is an introductory and a culminating lesson for the course. Each lesson plan includes a career information sheet (with a job title, duties, sample employment locations, an employment outlook, education and training requirements, special qualifications needed, earnings and benefits, and working conditions and life-styles), resources and/or materials (such as worksheets and evaluation sheets), learning objectives, learning activities, and evaluation procedures. The curriculum guide is illustrated with cartoon-like drawings. (KC)

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ED236325

Competency-Based Curriculum

for
Prevocational Exploration

Marine/Fresh Water

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PREFACE

It is with great pleasure that we bring you another West Virginia competency based education (CBE) curriculum. This competency based Prevocational Exploration Marine/Fresh Water curriculum was developed under contract for West Virginia. The effort was coordinated by staff of the West Virginia Department of Education, Bureau of Vocational, Technical and Adult Education.

This document is organized into five units: fishery, life sciences, marine life cultivation, research and water vehicle operation. The units and the job titles are listed in the Table of Contents.

The competency based Prevocational Exploration Marine/Fresh Water curriculum was disseminated to West Virginia career education instructors at inservices conducted in the fall and winter of 1983. Additional copies of this curriculum are available from the:

Vocational Curriculum Laboratory
Cedar Lakes Conference Center
Ripley, West Virginia 25271
Telephone: (304) 372-8673 or
Toll-free 1-800-642-2670 (in-state)

We trust this material will be of assistance in your program. Any suggestions you may have for improving this curriculum may be sent to our Vocational Curriculum Laboratory. Through this feedback we plan to continually update and revise our materials.

VOCATIONAL, TECHNICAL AND ADULT EDUCATION

Clarence E. Burdette
Assistant State Superintendent of Schools

FOREWORD

As students progress through their formal educational experiences, it is imperative that they be provided opportunities to investigate a wide range of occupations. Many rewarding and challenging occupations can be found in the Marine/Fresh Water Cluster.

Water is basic to all life. Therefore, it is entirely fitting that occupations be explored by students who will, in the near future, be choosing areas of work in which they can earn a livelihood and make contributions to better our society.

The oceans cover two-thirds of the earth. They provide food, influence the weather, offer transportation, and have great mineral value. A variety of resources has just begun to be tapped by mankind. Because of the important role that oceans are expected to play in our future, it is likely that there will be an ever increasing number of workers in the marine science field. Most jobs will require training and skill, but they will not all require college degrees. Through a better understanding of the various occupational requirements, students can become more knowledgeable of better ways to prepare themselves for satisfying employment in the Marine/Fresh Water Cluster.

In order for better career planning, it is important that teachers and students be provided up-to-date and accurate occupational information. Environmental occupations laboratory teachers of prevocational exploration can find a ready source of information in this Marine/Fresh Water Cluster curriculum covering occupations represented in career families pertaining to fishery, research, water vehicle operation, life sciences, and marine life cultivation. These materials should assist students to make sound educational and vocational choices and plans that will, hopefully, lead to rewarding occupational endeavors in the nation's job market.

The Bureau of Vocational, Technical, and Adult Education has provided assistance in the development of this project pertaining to the Marine/Fresh Water Cluster.

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CORE CURRICULUM IDENTIFICATION

The following learning pacs have been identified as core curriculum for the Marine/Fresh Water Cluster. All students within the Environmental Occupations Laboratory should be exposed to these learning pacs. Emphasis should be placed upon the nine lesson plans which are identified with a double asterisk. As time allows, attention should be extended to the remaining lessons in the identified core.

Marine/Fresh Water Cluster
Core Curriculum

Commercial Fisherman 5

**Deckhand, Fishing Vessel 16

**Fish Hatchery Worker 34

**Live Bait Supplier 71

**Fish Biologist 111

Microbiologist 139

Aquarium Tank Attendant 146

**Fish Culturist 182

**Hydrologist 222

Oceanographer, Physical 248

**Surveyor, Marine 265

Lock Operator 300

**Marina Worker 320

Mate, Ship 350

**Motorboat Mechanic 359

NOTE: A student survey instrument is available to measure the effectiveness of the identified core curriculum. For additional information regarding the survey contact the prevocational exploration staff in the Occupational, Adult, and Safety Education Department at Marshall University.

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**Identifies Core Curriculum that must be taught first
*Identifies Core Curriculum that should be taught if time allows for it.

ENVIRONMENTAL OCCUPATIONS
(Introductory Lesson)

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILIES:

and

REPRESENTATIVE JOB TITLES:

A. Fishery
   1. Commercial Fisherman
   2. Deckhand, Fishing Vessel
   3. Fish Hatchery Worker
   4. Live Bait Supplier

B. Life Sciences
   1. Fish Biologist

C. Marine Life Cultivation
   1. Aquarium Tank Attendant
   2. Fish Culturist

D. Research
   1. Hydrologist
   2. Oceanographer, Physical
   3. Surveyor, Marine

E. Water Vehicle Operation
   1. Lock Operator
   2. Marina Worker
   3. Mate, Ship
   4. Motorboat Mechanic
   5. Sportfishing Captain

OCCUPATIONAL TASK: Introducing the Marine/Fresh Water Cluster

OCCUPATIONAL COMPETENCY: Identifying occupational families and related occupations

RESOURCES and/or MATERIALS

1. Small medicine bottles and lids for housing occupational titles
2. Gallon jar (3/4 filled with water)
3. Activity Sheet A

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of career families found in the marine/fresh water cluster.
2. List representative job titles under each career family.
3. Appreciate some of the contributions made by workers in marine/fresh water occupations.

LEARNING ACTIVITIES

1. Pronounce and alphabetize the five career families.
2. Participate in "fishing" with information on Activity Sheet A.
3. Pronounce title of occupation and place under the appropriate career family.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Alphabetizing the five career families.
2. Participating in "fishing" activity on Activity Sheet A.
3. Matching occupation with proper career family.

Activity Sheet A

Cut apart the following information, fold the individual parts so they will easily go into a medicine bottle, tighten top securely on bottle, and place each container into the gallon jar containing the clear water.

Allow 15 students to individually fish for a bottle. Once the bottle has been "caught" by the student, the information should be shared with the class. This procedure should be followed until all the bottles have been opened and the information read to the class.

1. Commercial Fisherman - May be employed on a vessel that is a small trawler of twenty feet in length or a large factory-built ship three hundred feet long.

2. Deckhand, Fishing Vessel - Employed by sport and commercial fishing companies.

3. Fish Hatchery Worker - May find employment at refuges, hatcheries, or laboratories.

4. Live Bait Supplier - Employed by larger private industries who distribute live bait nationwide.

5. Fish Biologist - Employed by State departments of conservation or Federal agencies, particularly the Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and the Forest Service. A few work for aquariums, museums, biological consulting firms, tropical fish industry, private hatcheries, fishing clubs, and fish or bait farms.

6. Aquarium Tank Attendant - Employed by schools of oceanography, pet stores, zoos, amusement areas, museums, and/or independently controlled restaurants.

7. Fish Culturist - Works in State and Federal hatcheries.

8. Hydrologist - Employed by Federal, State, some local governments, regional or area planning authorities, private industry, research firms, and consulting firms.

9. Oceanographer, Physical - Employed by colleges, universities, Federal Government, private industries, and/or fishery laboratories of State and local governments.

10. Surveyor, Marine - Some private companies employ these workers, also U.S. Geological Survey, the National Oceanic and Atmosphere Administration, Army Map Service, and the Naval Oceanographic Office.

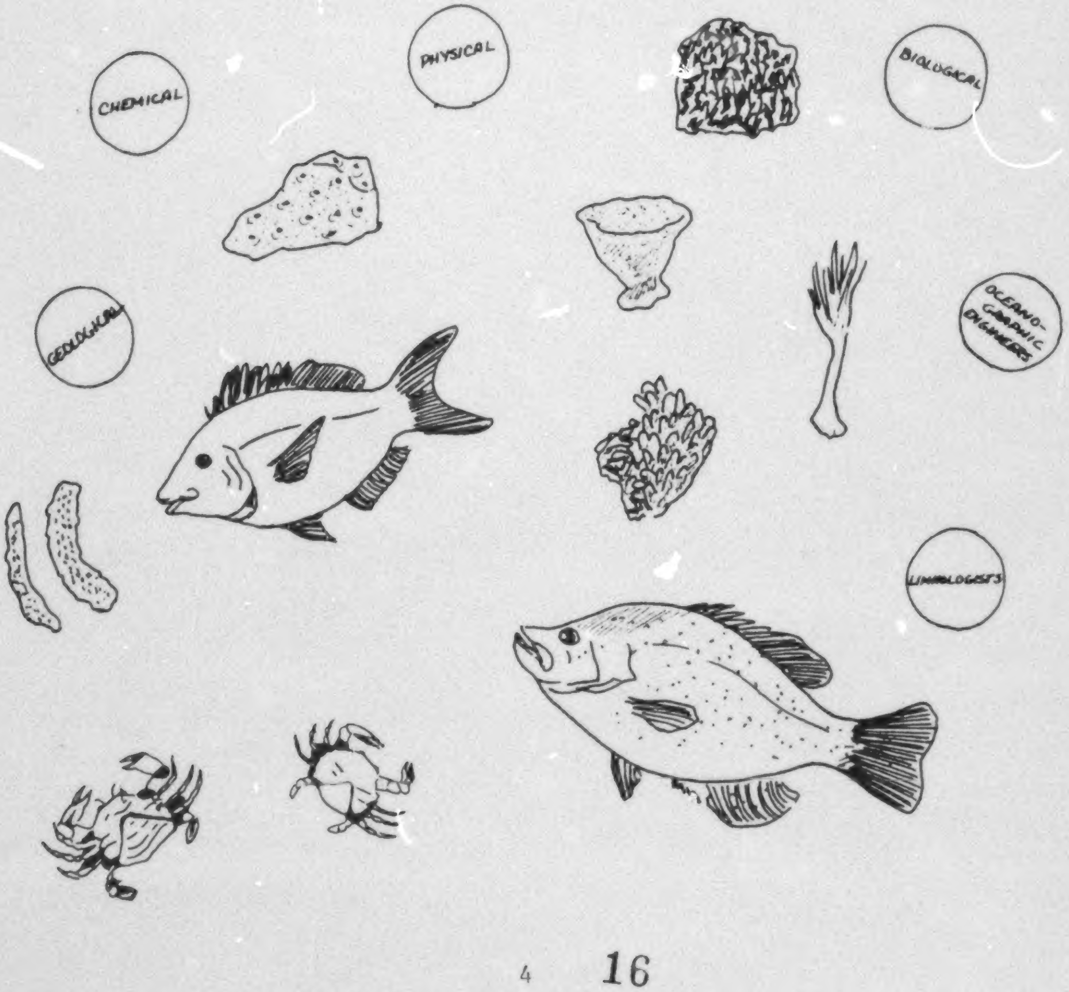
11. Lock Operator - Employed by Corp of Engineers to work at lock and dam locations on rivers, lakes, and/or canals.

12. Marina Worker - May work at marinas and/or boatyards on lakes, seacoasts, and waterways of the United States.

13. Motorboat Mechanic - May work for boat dealers and/or marinas.

14. Sportfishing Captain - Employed by private companies who have boats for business, leisure-time activities, and chartering.

15. Mate, Ship - Employed by United States oceangoing vessels such as freighters, tankers, and combination freighter-passenger vessels.


CHEMICAL
PHYSICAL
BIOLOGICAL
GEOLOGICAL
OCEANOGRAPHIC ENGINEERS
LIMNOLOGISTS

CAREER INFORMATION SHEET

JOB TITLE: Commercial Fisherman DOT CODE: 441-443.684-010

DUTIES:

The commercial fisherman's living depends on locating, catching, and landing fish and returning them to port for sale. The three basic ways of catching fish are snaring, luring, and attacking.

Ocean fishermen sail on vessels of various sizes. The crew functions as a unit in handling various types of fishing gear and as a group of individuals in the sharing of housekeeping duties on board a fishing craft. Employees on the fishing vessels are responsible for repairing and readying the nets or lines to be used in catching the fish. Depending upon the size of the fishing vessel, commercial fishermen may be responsible for reading messages of echo sounders, sonar equipment, and telemetering devices used in identifying schools of fish. Once the school of fish is identified the equipment is let down into the water and later the nets and lines are hauled in. The different kinds of fish caught are prepared for storage in a specified icing process.

The inland fishermen may fish in one lake every day or transfer their equipment by truck from lake to lake for aquatic hunting. They may set gill nets and bring up dead fish daily. These workers may employ hoop or fyke, pound or trap nets which are lifted once a week.

The crew of a fishing vessel must distribute their work activities, and each fisherman must take a turn in the handling of chores such as standing wheel watch, making accurate entries in the logbook, helping in

	the loading of supplies, cleaning fish, mending nets, repairing machinery, and/or washing down the deck.
WHERE EMPLOYED:	Commercial fishermen may be employed on a vessel that is a small trawler of twenty feet in length or a large factory-built ship three hundred feet long. An independent fisherman may operate his own boat and employ other people to work for him or a larger company may employ a crew of workers. Inland or fresh water fishermen may enter into a contractual agreement with a state, and, if so, they are restricted in the amount of water where fishing is done and the species of fish which may be harvested.
EMPLOYMENT OUTLOOK:	The employment outlook for commercial fishermen is most favorable. The public is being made more aware of the value of fish as a highly nutritional source of food. Consequently, it is expected to be a great demand for skillful fishermen in all parts of the country to fill the needs of the commercial fishing industry.
EDUCATION AND TRAINING:	A high school education is preferred. Courses pertaining to navigation, marine biology, marketing, and/or marine technology offered by vocational-technical schools and/or colleges may be an asset. On-the-job training can be received by working as a helper for seasoned fishermen. Inland or border water fishermen must be licensed in all states.
SPECIAL QUALIFICATIONS:	Persons aspiring to become commercial fishermen should be exceptionally rugged and strong and able to

endure long periods of extremely hard work. This employee must be self-contained, courageous, and patient to work under the varied conditions associated with this vocation. As a member of a crew, the worker should be adaptable and able to work well with other people.

EARNINGS AND ADDITIONAL BENEFITS:

Most of the time commercial fishermen's incomes are based upon percentages of the catch. The vessel owner keeps a designated percentage of the total earnings and divides the remaining amount among the crew members. Variations of income can range from subsistence level to a gross of $70,000 per year. However, the average income of full-time fishermen is between $7,500 and $12,000 annually.

Factors such as the amount of a catch, weather, and the demand for fish make the income from fishing unpredictable from day to day.

Fishermen who have entered into a contract with a state pays that state an established rate per pound for certain species and size classes of fish and in return are allowed to fish in designated areas. A state official is present for the weighing of the fishermen's catch to make sure it conforms to the specifications of the contracts. After the catch has been weighed, the fishermen may dispose of the fish through selling or putting them in a holding crib until a purchaser is identified.

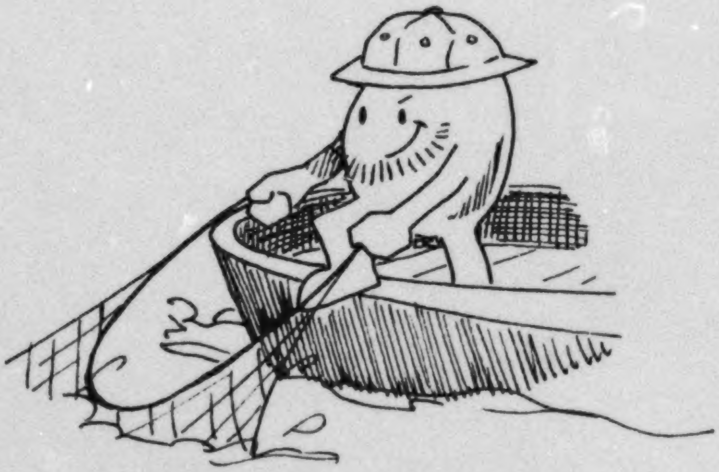
The kinds and amounts of fringe benefits depend upon the individual company for which the employed fishermen are working.

WORKING CONDITIONS AND LIFESTYLES:

The fishing vessel may be small and allow seating for just two people and a holding crib for fish, or it may be large and have complete living quarters, galley, and a spacious holding crib with an icing area. In the larger vessels, the quarters are usually warm, dry, and well-lighted. A crew may range from two people to sixty depending upon the size of the vessel.

Inland fishermen usually work during daylight hours. They may set out in the craft at sunrise and return to shore at dusk.

Marine fishermen may be required to travel over great distances on the water and average being gone from home 250 days a year. This worker's hours are not limited and may amount to eighteen or twenty hours a day. In addition to fishing, commercial fishermen are involved with vessel and maintenance chores.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

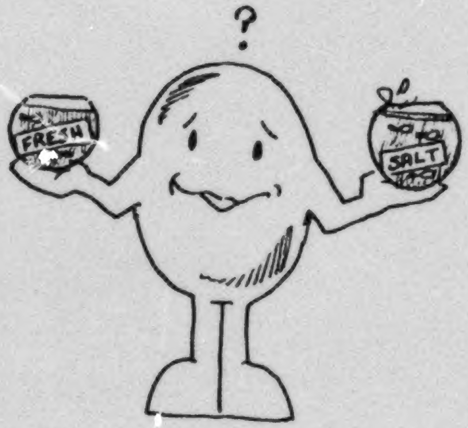
Commercial Fisherman	441-443.648-010
Fisher, Diving	443.664-010
Fisher, Net	441.684-010
Fisher, Line	442.684-010

OCCUPATIONAL TASK: Exploring commercial fishing

OCCUPATIONAL COMPETENCY: Distinguishing between salt and fresh water fish

RESOURCES and/or MATERIALS

1. Copies of Career Information Sheet
2. Transparency or chalkboard for "WHAT'S MY LINE?" information
3. Copies of Activity Sheet A: WHAT YOU CAN DO WITH FISH



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Determine whether fish use salt or fresh water as their residence.
2. Appreciate the contribution that fish make to many useful products.
3. Recognize the need for commercial fishermen.

LEARNING ACTIVITIES

1. Read and discuss Career Information Sheet pertaining to commercial fisherman.
2. Pronounce the 15 kinds of fish listed under Fresh Water Fish and Salt Water Fish indicated on "WHAT'S MY LINE?" Challenge students to memorize the two lists.
3. Complete Activity Sheet A: WHAT YOU CAN DO WITH FISH.
4. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading and discussing Career Information Sheet.
2. Participation in pronouncing names of fresh and salt water fish.
3. Completing Activity Sheet A: WHAT YOU CAN DO WITH FISH.
4. Completing the Student Attitude Sheet.

WHAT'S MY LINE?

Fishing can be fun, relaxing, and profitable. It is available for everyone, regardless of age. Many thousands of lakes, ponds, and streams are scattered throughout America. Our vast seacoast offers unlimited sport for salt water lovers, whether people are fishing from a pier, or trolling the depths from a charter boat.

FRESH WATER FISH

1. Atlantic Salmon
2. Bluegill
3. Brook Trout
4. Calico Bass
5. Carp
6. Channel Catfish
7. Grayling
8. Lake Trout
9. Largemouthed Bass
10. Smallmouthed Bass
11. Smelt
12. Sunfish
13. Walleyed Pike
14. White Crappie
15. Yellow Perch

SALT WATER FISH

1. Atlantic Sailfish
2. Bluefin Tuna
3. Bluefish
4. Channel Bass
5. Cod
6. Dolphin
7. Flounder
8. Great Barracuda
9. Haddock
10. Herring
11. King Salmon
12. Mackerel
13. Pampano
14. Porgy
15. Sea Bass

Activity Sheet A

WHAT YOU CAN DO WITH FISH

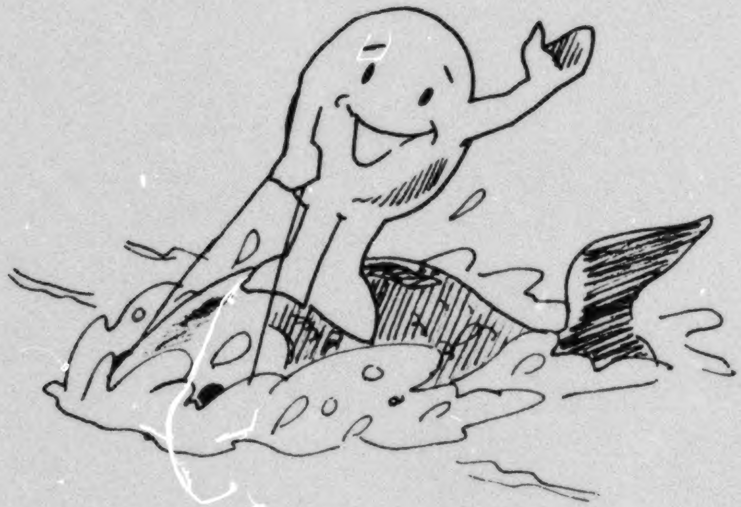
Statistics reveal that commercial fishing in the U.S. employs approximately 132,000 fishermen. The five billion pounds of fish caught every year are valued at about 640 million dollars. If you should someday become employed as a fisherman, hopefully you will recall some of the products which are made from fish. Match Column B with Column A by placing the appropriate alphabet letter in front of a number.

	Column A (Parts of a fish)		Column B (Products made from fish)
____ 1.	Head	A.	Soap, paint, shortening, metal plating, printing ink
____ 2.	Entrails	B.	Gelatin, used in making jelly, wine, beer, cement
____ 3.	Flesh and Roe	C.	Glue, fertilizer, animal feed
____ 4.	Oils, used in	D.	Iodine, important in prevention of common goiter
____ 5.	Air Bladder	E.	Vitamins, Hormones, Insulin
____ 6.	Scales	F.	"Egg white"
____ 7.	Shark Skin	G.	Human food, protein, minerals, Vitamins A, D
____ 8.	Bones, Fins, Entrails	H.	Fertilizer, animal feed
____ 9.	Salt-Water Fish	I.	Leather, metal smoothing and polishing
____ 10.	Fish Albumen	J.	Artificial pearls

Information Sheet A

KEY

1. C
2. E
3. G
4. A
5. B
6. J
7. I
8. H
9. D
10. F



FISHING AREAS

In the chart below, determine which four counties have the largest fishing areas and the names of the places.

	NAME	COUNTY	ACRES OF WATER
1.	Teter Creek	Barbour	35
2.	Sleepy Creek	Berkley/Morgan	205
3.	Fork Creek	Boone	1
4.	Elk River	Braxton	1,520
5.	Castleman Run	Brooke	22
6.	Plum Orchard	Fayette	202
7.	Edwards Run	Hampshire	2
8.	Warden	Hardy	36
9.	Turkey Run	Jackson	15
10.	Stonecoal	Lewis/Upshur	550
11.	Bluestone	Mercer/Summers	2,040
12.	Burches Run	Marshall	16
13.	Chief Cornstalk	Mason	5
14.	McClintic	Mason	61
15.	Berwind	McDowell	20
16.	Laurel Lake	Mingo	29
17.	Moncove	Monroe	144
18.	Summersville Lake	Nicholas	2,700
19.	Bear Rocks	Ohio	16
20.	Handley	Pocahontas	5
21.	Bruceton Mills	Preston	Stream
22.	Tygart Lake	Taylor	1,750
23.	Pleasants Creek	Taylor/Barbour	11
24.	Conaway Run	Tyler	30
25.	Big Ditch	Webster	55

Name ______________________________

Occupational Cluster Marine/ Fresh Water - Commercial Fisherman

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading and discussing Career Information Sheet					
Pronouncing kinds of fresh/salt water fish					
Completing Activity Sheet A: WHAT YOU CAN DO WITH FISH					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Deckhand, Fishing Vessel DOT CODE: 449.667-010

DUTIES:

Deckhands are responsible for any combination of many duties. They must be able to attach nets, slings, hooks, and other lifting devices to cables, booms, and hoists. Other duties include loading equipment and supplies aboard vessels by hand or using hoisting equipment, pulling and guiding nets and lines onto vessels, removing fish from nets and hooks, and/or sorting and cleaning marine life and returning undesirable and illegal catches to the sea.

In addition to these duties, deckhands are responsible for the safety of the passengers and for making sure that the customers have a good time by helping them to catch fish. When the boat reaches the fishing area, they throw bait in the sea to attract fish. They assist those passengers who need help with landing a fish. A gaff or a net is used to bring the fish aboard. They clean the fish for the passengers and sometimes are called upon to identify fish for amateur anglers.

Deckhands are responsible for the condition of the boat, except for the mechanical devices which are the concern of the captain. They wash the fishing vessel down at the end of each trip, stow gear in its proper place, and get the boat ready for the next trip.

WHERE EMPLOYED:

These workers are employed by sport and commercial fishing companies. Sportfishing deckhands are employed for party boats.

EMPLOYMENT OUTLOOK:

Competition for the available jobs may be keen during the next decade. Small boat ownership is reducing job availability. Most job openings will result from the need to replace deckhands who have left the occupation.

EDUCATION AND TRAINING:

A high school education is preferred. Courses pertaining to navigation and marine biology offered by vocational-technical schools and/or colleges may prove helpful.

There is no formal education or apprenticeship program leading to work as a deckhand.

SPECIAL QUALIFICATIONS:

Individuals aspiring to work as a deckhand should have good health and physical strength. They should possess the ability to adapt quickly to emergency situations and be able to get along well with other people. They must be able to withstand many hours of exposure to hot sunshine, understand the mechanical principles of deck equipment, work long hours of hard physical labor, and understand the principles of fishing. An important asset is excellent visual acuity and color perception.

EARNINGS AND ADDITIONAL BENEFITS:

The deckhand's income is largely supplemented by tips. Tips received are for cleaning fish for passengers.

Most often these employees work 12 to 13 hours a day for 100 days from May until Labor Day with an average earning of $35 to $100 per day.

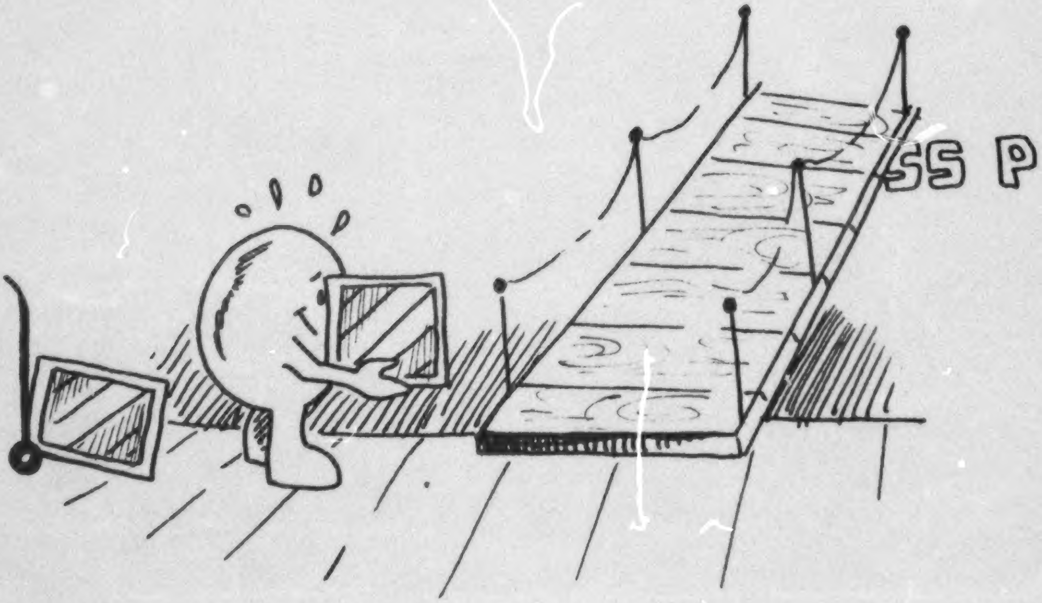
Some landing companies provide group accident and health insurance coverage for their employees, and the employees in turn have the option of including their dependents at favorable group rates.

WORKING CONDITIONS AND LIFESTYLES:

In larger fishing vessels, the quarters are usually comfortable. However, the work is seasonal and determined by the weather.

There is a great deal of talking and listening involved in this occupation, as well as lifting, climbing, crawling, stooping, and standing.

Depending upon the length of the fishing trip, deckhands may be away from their homes for extended periods of time and required to work every day and late hours at night.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

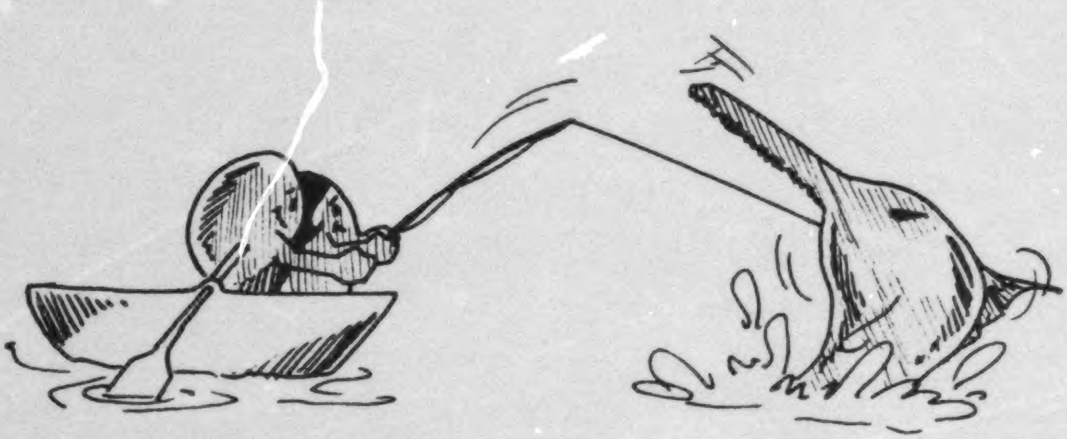
OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Deckhand, Fishing Vessel	449.667-010
Aquarist	449.674-010
Net Repairer	449.664-010

OCCUPATIONAL TASK: Exploring deckhand duties

OCCUPATIONAL COMPETENCY: Assisting amateur anglers



RESOURCES and/or MATERIALS

1. Career Information Sheets
2. Worksheet A: Self-Inventory

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Recognize the function and value of deckhands.
2. Express your understanding of the activities performed and the working conditions of a deckhand.
3. Decide if you are interested in learning more about becoming a deckhand.

LEARNING ACTIVITIES

1. Read Career Information Sheet for a fishing vessel deckhand.
2. Complete Worksheet A: Self-Inventory.
3. Examine magazines and/or newspapers for pictures and articles pertaining to fishing and boating. If permissible, cut pictures and prepare a collage.
4. Write "A Fish Tale" of the big fish that got away.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Completing Worksheet A: Self-Inventory.
3. Participation in making collage and/or writing fish tale.

WORKSHEET A

SELF-INVENTORY

Check the following statements in the YES or NO column which best describes how you feel with respect to fishing vessel deckhands.

YES	NO	
___	___	1. Do you like being around large bodies of water?
___	___	2. Does fishing interest you?
___	___	3. Do you like to look at magazines and/or books pertaining to fishing?
___	___	4. Are you enjoying good health and physical strength at the present time?
___	___	5. Do you have excellent visual acuity and color perception?
___	___	6. Are you able to adapt quickly to emergency situations?
___	___	7. Do you ever go fishing during your leisure time?
___	___	8. Do you enjoy being exposed to hot sunshine for many hours?
___	___	9. Do you enjoy being around people and interacting with them?
___	___	10. Would you be opposed to doing tasks which require lifting, climbing, crawling, stooping, and/or standing?

CAREER INFORMATION SHEET

JOB TITLE: Fish Cutter DOT CODE: 525.684-030

DUTIES:

A person employed as a fish cutter may have to clean fish aboard ship or ashore, depending upon where s/he is working. S/He may work alone or as a member of a crew. During the cleaning process, this employee scrapes scales from fish with knife, cuts or rips the fish from the vent to the throat with a knife, and tears out viscera and gills. The next step is to cut off the head of the fish with a knife, drop the head in a tub, and slide the fish to the next worker.

This worker washes all the blood from the abdominal cavity by dropping the fish in a tub of water or by using a hose. The discolored membrane from abdomen lining is removed by using a knife, spoon, scraper, glove, or piece of burlap. Gashes are then cut along the sides of the fish to facilitate salt penetration during curing.

After the fish is properly cleaned, it is cut into pieces from behind gill slits down backbone and ribs to free fillet (boneless portions of flesh). The fish cutter places the fillet skinside down on the work table and draws a knife laterally between the skin and flesh to remove the skin. S/He then slices the flesh from the bones in fletches (longitudinal quarter sections) for further processing into boneless slices of fish.

In some fish processing plants, the fish have already been cleaned when they arrive at the fish cutter. In this case, fish are placed on a large table with a moving conveyor belt.

The strips of fish are straightened and the belt moves them into the cutting machine. The fish are cut into pieces about the same size so they are ready for packing.

The conveyor belt takes the cut-up fish and dumps them in a vat that has clean water in it. After the fish soak in the clean water for awhile, the fish cutter shovels them into another vat full of a special sauce that makes them taste good. The fish are left in a cooling room overnight.

If the fish are to be frozen, they are placed in boxes and frozen instead of in the special sauce. Sometimes the clean fish pieces are coated with a bread mixture or a batter before they are packaged.

Fish cutters may be asked to perform other tasks, particularly during a slower work season, April through August.

WHERE EMPLOYED: Fish cutters are employed generally by fish processing plants. Some may become employed by owners of boats.

EMPLOYMENT OUTLOOK: The employment outlook is expected to be favorable. Because the population in the U.S. continues to increase, it is anticipated that fish processing plants will also increase. It is true that new machines now do some of the work, but the processors must have people to run the machines.

EDUCATION AND TRAINING: It is highly recommended that aspirants finish high school before applying for work as a fish cutter. No special training is needed for this job. Once you become employed, the employer will furnish on-the-job training.

While in junior and senior high school, students should participate in shop and woodworking classes, English, and physical education classes. Working part-time in a cafeteria or fast-food business and/or working model kits are ways to get experience in working with your hands and learning the importance of always being clean.

SPECIAL QUALIFICATIONS:

A fish cutter is expected to always be at work on time. S/He must strive to keep herself/himself very clean and neat in appearance. A pleasing personality is well accepted by other workers.

EARNINGS AND ADDITIONAL BENEFITS:

An expected wage for a beginning fish cutter averages about $5 an hour. Good fish cutters in some places of employment earn close to $6 an hour.

In addition to wages, an employer may help pay for hospitalization insurance and a retirement plan for each employee. Depending upon the individual company's policy and the amount of time employed, the fish cutter is allowed vacation time off with pay.

WORKING CONDITIONS AND LIFESTYLES:

Most fish processing plants are very modern and pleasant places in which to work. These workers are required to wear uniforms, heavy aprons, and rubber-soled shoes. Many times, the uniforms and aprons are supplied by the employer.

The floor of the fish processing plant is usually wet. Fish cutters are required to stand while performing the tasks associated with this occupation. Sometimes, lifting and/or moving heavy barrels and/or vats of fish can be strenuous. A fish cutter generally works eight hours a day, five days a week.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Fish Cutter	525.684-030
Fish-Bin Tender	529.687-082
Fish-Boning-Machine Feeder	521.686-034

OCCUPATIONAL TASK: Preparing fish for cooking

OCCUPATIONAL COMPETENCY: Cleaning and filleting fish

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. "Peep's Ways For Preparing Fish To Cook"
3. One fish to fillet
4. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Appreciate people who are employed in fish processing plants.
2. Better understand how to clean and prepare fish for cooking.
3. Discuss advantages and disadvantages of working as a fish cutter.

LEARNING ACTIVITIES

1. Discuss the printed information on the Career Information Sheet.
2. Compile a list of the various ways fish are packaged for sale at a local grocery store.
3. Identify from the package where the fish were processed.
4. Study "Peep's Ways For Preparing Fish To Cook."
5. If possible, the teacher should demonstrate filleting a fish.
6. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

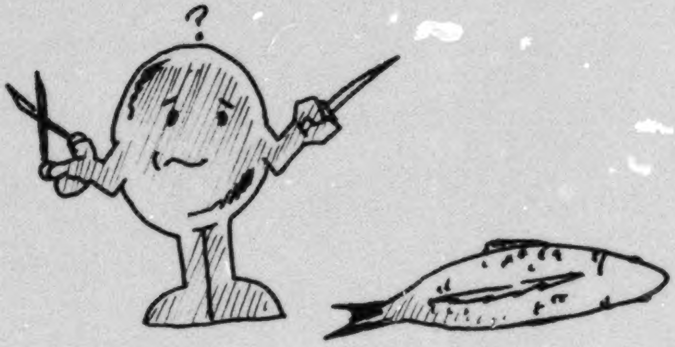
1. Discussing the Career Information Sheet pertaining to fish cutter.
2. Compiling a list of ways fish are packaged at a local grocery store.
3. Identifying states where fish were processed.
4. Studying "Peep's Ways For Preparing Fish To Cook."
5. Completing the Student Attitude Sheet.

"Peep's Ways For Preparing Fish To Cook"

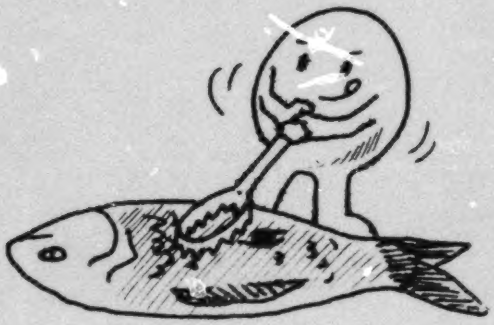
In the following pages, Peep is going to share tips about how to prepare fish for cooking. Peep enjoys fishing and tries to keep the cleaning and filleting as simple as possible.

CLEANING

Step 1. Remove the fins. Use a pair of scissors or a sharp knife for removing the fins. Be sure to do this work on a hard wooden board.



Step 2. Remove the scales. Use a strong pocket knife or a fish scaler to remove the scales. When using a fish scaler, rub firmly from the tail toward the head. Remember, trout do not have to be scaled.



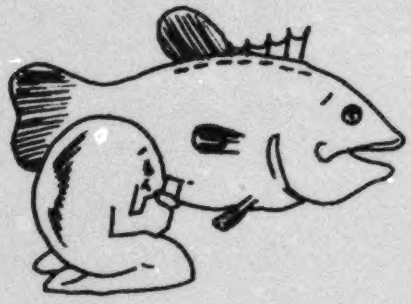
Step 3. Remove the entrails. This step is not so much fun; however, it is necessary. Using a strong pocket knife, make a slit down the underside of the fish, from the head to the anal vent. Remove the entrails, scrape the cavity clean, then wipe and dry it with a clean cloth.

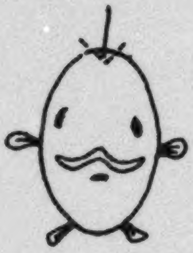
Step 4. Cut off the head. Use a sharp knife. In case you plan to leave the head on the fish when it is being served, you should remove only the eyes and gills now.

SKINNING

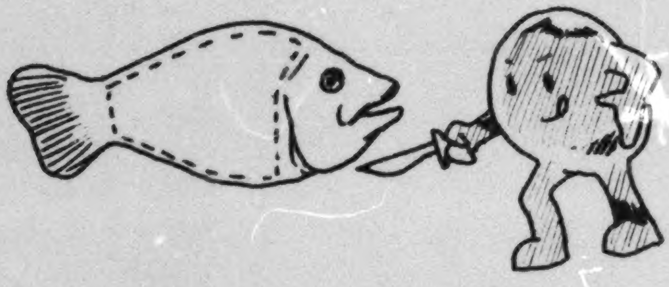
Sometimes it is better to skin certain fish. For example, fish whose habitat is weedy ponds may produce a better taste if they are skinned before cooking them. If a muddy taste should exist, it will go with the skin.

Step 1. Remove the fins. Using a strong sharp knife, remove the fins by making a diagonal cut on each side.

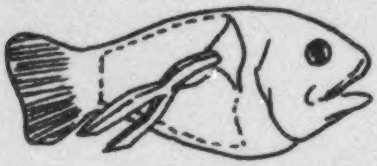




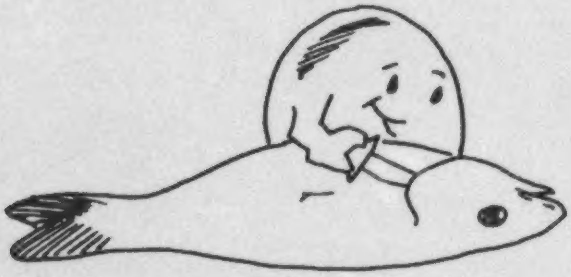
Step 2. Cut through the skin on each side.



Step 3. Peel off the skin. Use a good pair of pliers and grasp the upper corner of the skin and peel it off by pulling downward toward the tail. Now, that was easy, wasn't it?



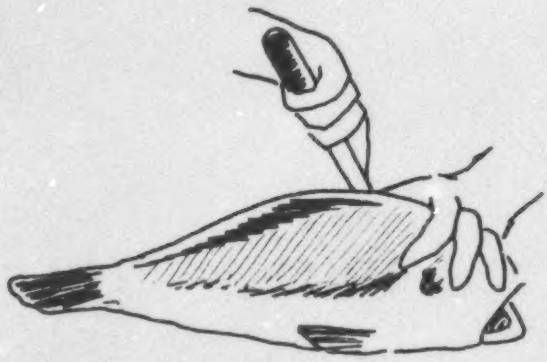
Step 4. Cut off the head. Again, use a sharp knife and cut off the head of the fish. Make a slit down the underside of the fish, from the head to the anal vent, and remove the entrails. After proper washing and drying, your fish should be ready for cooking.



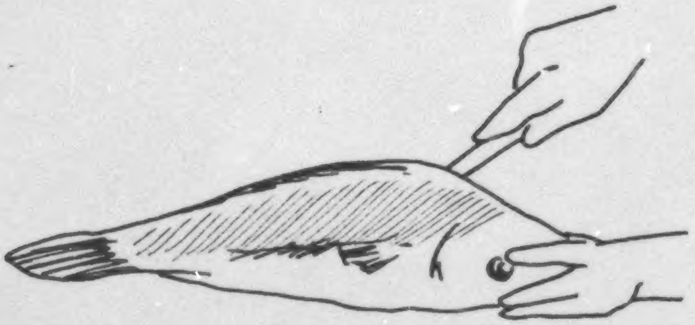
FILLETING

There are several ways to fillet fish. However, if your time is limited, you simply do not care to remove entrails, clean up untidy work areas, and/or you want fish fillet to eat, here is a step-by-step process Peep uses to get desired results. This method has been used quite successfully by Peep with a tremendous variety of fish.

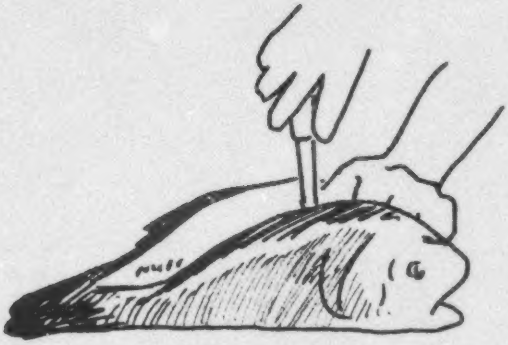
Step 1. Make two cuts near the dorsal fin. Use a sharp fillet knife, make two cuts, one on each side of the dorsal fin. These cuts should be very close to the dorsal fin, as deep as the backbone, and run lengthwise from behind the head to the tail.



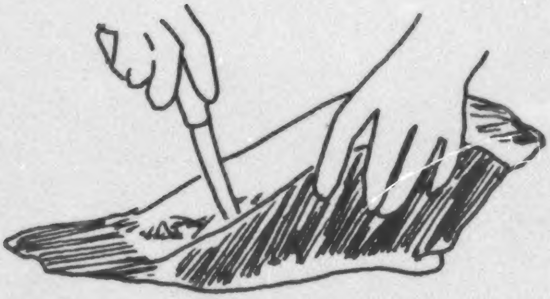
Step 2. Make a diagonal cut just behind the head and down to the backbone.



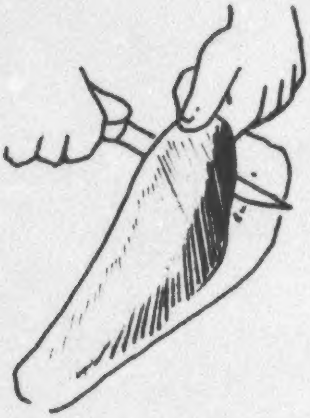
Step 3. Carve off a complete fillet without any waste. Slip the knife into one of the initial cuts made alongside the dorsal fin and begin to work the blade around the backbone and rib cage. Carefully cut the fillet away from the body of the fish.

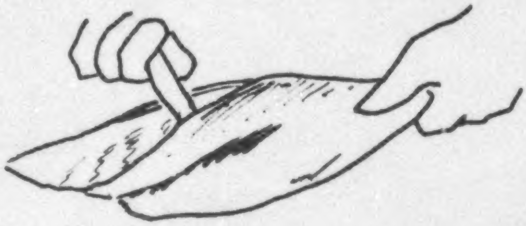


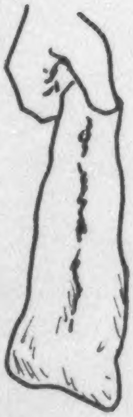
Step 4. Cut through the belly skin and separate the fillet completely from the fish. Turn the fish over and cut away the fillet on the other side exactly the same way.

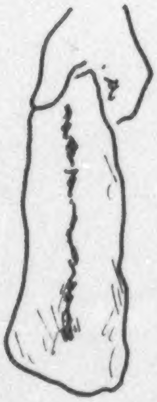


Step 5. Remove the skin. To skin the fillet, place it flesh side up. While holding the fillet down with fingers or tines of a fork, work the flat of the blade forward and separate the meat from the skin. You may discover that a slightly dull knife works better for skinning than a sharp fillet knife.







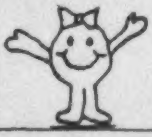
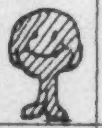
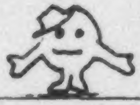
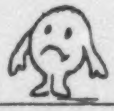
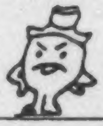


Name ______________________________

Occupational Cluster Marine/Fresh Water - Fish Cutter

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it 
Discussing Career Information Sheet					
Compiling list of packaged fish at local grocery store					
Identifying places where fish were processed					
Studying "Peep's Ways For Preparing Fish to Cook"					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Fish Hatchery Worker DOT CODE: 446.684-010

DUTIES:

A fish hatchery worker performs any combination of tasks to trap and spawn game fish, incubate eggs, and rear fry in a fish hatchery. S/He may secure a net on both banks of a river to divert fish to a holding pond. This worker regulates temperatures of indoor tanks; sorts fish according to size, coloring, and species; and transfers fingerlings to rearing ponds or tanks, using buckets or tank trucks. S/He scatters food over the surface of the water by hand or activates a blower that automatically scatters food over the water to feed the fish.

The fish hatchery worker transfers mature fish to rivers and lakes, using a tank truck. S/He records field data and prepares reports of hatchery activities. This hatchery worker drains and cleans ponds and troughs, using brushes, chemicals, and water. When necessary, the worker makes minor repairs to hatchery equipment, paints, buildings, and maintains grounds.

WHERE EMPLOYED:

These workers may be employed at refuges, hatcheries, or laboratories. The majority are employed at fish hatcheries.

EMPLOYMENT OUTLOOK:

The employment outlook is expected to remain fairly constant during the 1980's. Additional employees may be hired as some workers retire, die, or change employment for other reasons.

EDUCATION AND TRAINING:	A high school education is preferred. Courses where basic skills were mastered in plumbing, carpentry, and electrical applications may be beneficial as a fish hatchery worker. Having the ability to add, subtract, multiply, divide, and work simple fractions is important in many operations completed by a fish hatchery worker.
SPECIAL QUALIFICATION:	An aspirant should be able to demonstrate patience on the job. S/He should care for fish and enjoy working out of doors. This worker must be knowledgeable of and willing to become involved in selecting tools, deciding on methods to be used in order to complete an assignment independently.
EARNINGS AND ADDITIONAL BENEFITS:	The salary depends upon education, experience, and entry level of the employee. The fish hatchery worker can expect to earn $10,000 - $25,000 per year. Fringe benefits will depend upon the employer - Federal, State, or local employer.
WORKING CONDITIONS AND LIFESTYLES:	The working conditions may include a considerable amount of standing, stooping, bending, climbing, and working in tiring or uncomfortable positions. Occasionally, some work may have to be completed from ladders and scaffoldings. Much of the work is completed out of doors. The work requires average agility and dexterity.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

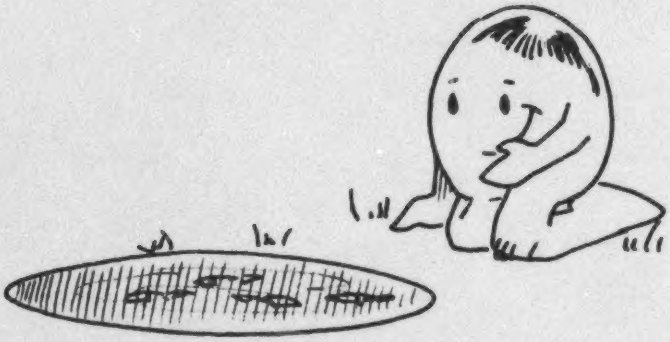
OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Fish Hatchery Worker	446.684-010
Shellfish-Bed Worker	446-684-014
Soft Crab Shedder	446.684-018
Laborer, Aquatic Life	446.687-014

OCCUPATIONAL TASK: Exploring fish hatchery activities

OCCUPATIONAL COMPETENCY: Determining distribution of trout fish



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A
3. Activity Sheet A
4. Student Attitude Sheet

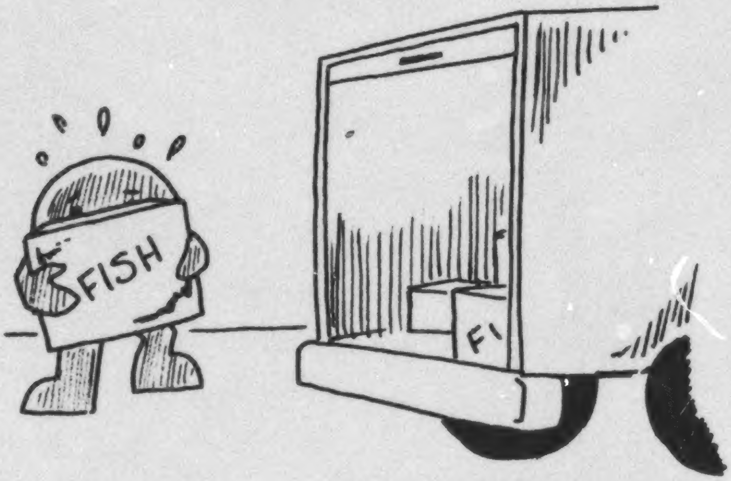
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss the responsibilities associated with a fish hatchery worker.
2. Realize the importance of being able to apply mathematical computations.
3. Appreciate the contributions made by workers at a fish hatchery.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet information pertaining to fish hatchery worker.
2. Read Information Sheet A.
3. Complete Activity Sheet A.
4. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with information pertaining to a fish hatchery worker.
2. Reading Information Sheet A.
3. Completing Activity Sheet A.
4. Completing and submitting to the teacher the Student Attitude Sheet.

Information Sheet A

Fish food consists of a combination of the following items:

- (a) fish meal
- (b) cottonseed or soybean meal
- (c) wheat middlings
- (d) whey
- (e) salt
- (f) assorted vitamins
- (g) other ingredients

It takes 1.8 pounds of feed to produce one pound of weight to an Eastern Brook, German Brown, and/or a Rainbow trout fish.

A 100-foot concrete raceway at Bowden National Fish Hatchery in Elkins, West Virginia can hold 11,000 nine inch trout.

While housed in the raceway, the fish remove oxygen from the water by "breathing" and deposit carbon dioxide and other metabolic waste products. Agitation of the water by means of mechanical aerators adds oxygen back into the water and helps remove metabolic gases.

The earthen ponds serve multiple purposes: research, display fish for aquaria, and area for holdover fish.

Activity Sheet A

The Career Information Sheet indicated that a fish hatchery worker should have the ability to add, subtract, multiply, and divide. How many of the following problems can you solve? Show your computations in the spaces provided.

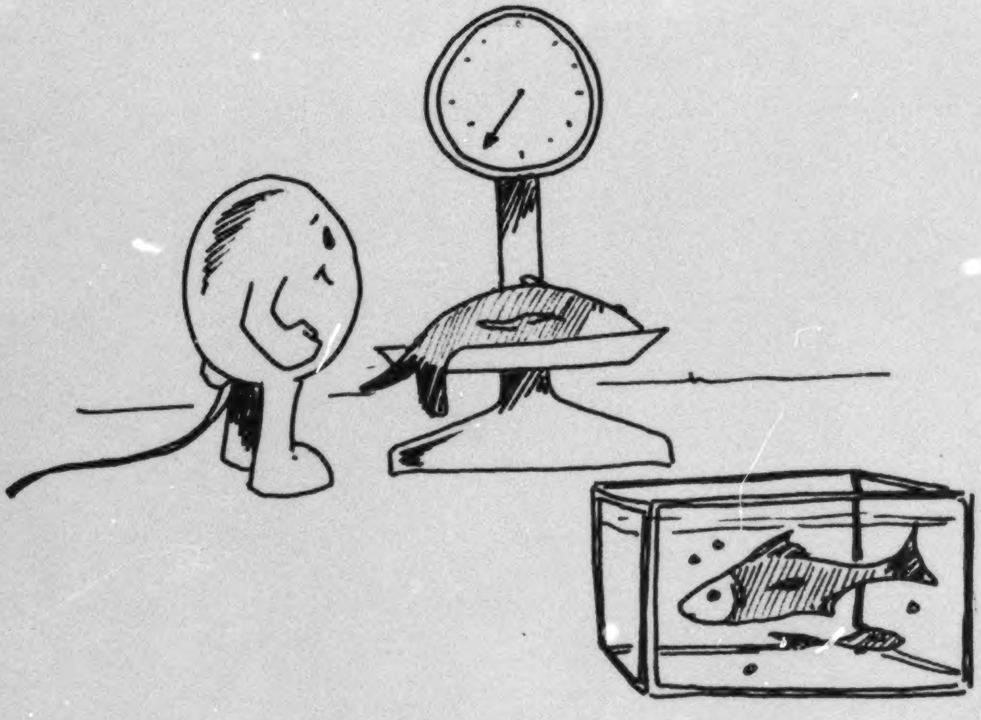
1. The function of the Bowden Fish Hatchery is to produce 160,000 pounds of rainbow, brook, and brown trout of catchable size annually for stocking in Federal and State waters. The stocking season is from January through the first week of June.
   Using Information Sheet A, how many pounds of feed will it take to produce the 160,000 pounds of trout at the fish hatchery?

2. How many fish could be ready for releasing weighing 2.5 pounds each?

3. How many fish could be ready for releasing weighing 3 pounds each?

4. How many fish could be ready for releasing weighing 4 pounds each?

5. If the trout average .75 inch per mouth growth, how much time will it take for a fish to grow to 9 inches in length and be ready for releasing?



Activity Sheet A - Key

1.
$$\begin{array}{rl} 160{,}000 & \text{pounds of fish}\\ \underline{\times\ 1.8} & \text{pounds of feed}\\ 1280000 & \\ \underline{160000} & \\ 2880000 & \text{pounds of feed} \end{array}$$

2.
$$\begin{array}{r} 64{,}000.\\ 2.5\overline{)160{,}000.0}\\ \underline{150\phantom{{,}000.0}}\\ 100\\ \underline{100} \end{array}$$

(check)
$$\begin{array}{r} 64{,}000\\ \underline{2.5}\\ 320000\\ \underline{128000}\\ 1600000 \end{array}$$

3.
$$\begin{array}{r} 53{,}333.\\ 3\overline{)160{,}000.}\\ \underline{15\phantom{0{,}000.}}\\ 10\phantom{{,}000.}\\ \underline{9}\phantom{{,}000.}\\ 10 \end{array}$$

(check)
$$\begin{array}{r} 53{,}333\\ \underline{3}\\ 159{,}999 \end{array}$$

4.
$$\begin{array}{r} 40{,}000\\ 4\overline{)160{,}000} \end{array}$$

(check)
$$\begin{array}{r} 40{,}000\\ \underline{4}\\ 160{,}000 \end{array}$$

5. $.75 \times t = 9$ inches

$t = \frac{9}{.75}$

$t = 12$ months

(check) $.75 \times 12 = 9$

$9.00 = 9$

Name ______________________

Occupational Cluster Marine/Fresh Water - Fish Hatchery Worker

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with the Career Information Sheet					
Reading facts about fish food					
Completing mathematical calculations pertaining to fish					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________

CAREER INFORMATION SHEET

JOB TITLE: Fisher, Net

DOT CODE: 441.684-010

DUTIES:

A net fisher catches finfish, shellfish, and other marine life alone or as a crew member on shore or aboard a fishing vessel using any one of a variety of nets. This employee inserts and attaches rods, poles, ropes, floats, weights, and cables to form, position, set, and anchor the net. The fisherman puts the net into water and anchors or tows the net according to the kind of net being used, location of fishing area, and method of fishing.

A net fisher hauls the net to the boat or ashore manually with the help of a winch. The catch of fish is emptied and stowed in containers or is transferred to a base ship. This employee may sort and clean fish, repair fishing nets and gear, and/or act as a lookout or observe instruments to sight schools of fish.

WHERE EMPLOYED:

Fishermen are employed on a vessel that may be a small trawler of twenty feet in length or a large factory ship three hundred feet long. An independent fisherman may operate his own boat and employ other people to work for him or a large company may employ a crew of workers.

EMPLOYMENT OUTLOOK:

The employment outlook for fishermen is good. There is an increasing national awareness of the value of fish as a highly nutritional source of food. Consequently, there may be a great demand for skillful fishermen in all parts of the country to fill the needs of the commercial fishing industry.

EDUCATION AND TRAINING:

A high school education is preferred. Courses pertaining to navigation, marine biology, marketing, and/or marine technology offered by vocational-technical schools and/or colleges may be an asset. On-the-job training can be received by working as a helper for a seasoned fisherman.

Inland or border water fishermen must be licensed in all states.

SPECIAL QUALIFICATIONS:

An aspirant as a fisherman should be exceptionally rugged and strong and able to endure long periods of extremely hard work. This employee must be self-contained, courageous, and patient to work under the varied conditions associated with this vocation. As a member of a crew, the individual should be adaptable and able to work well with other people.

EARNINGS AND ADDITIONAL BENEFITS:

Often the net fisherman's income is the money obtained through a certain share of the catch. The vessel owner keeps a certain percentage of the total earnings and divides the remaining amount equally among the crew members. Variations of income can range from subsistence level to a gross of $70,000 per year. Factors such as the amount of a catch, the weather, and the demand for fish make the income from fishing unpredictable even from day to day. Nevertheless, the average income of full-time fishermen is between $7,500 and $12,000 annually.

The kinds and amounts of fringe benefits depend upon the individual company for which the employed fisherman is working.

WORKING CONDITIONS AND LIFESTYLES:

The fishing vessel may be small and allow seating for only two people and a hold for fish, or it may be a floating home, complete with living quarters in an upper deckhouse, sleeping quarters, galley, and a spacious hold with an icing area. In the larger vessels, the forecastle is usually warm, dry, and well lighted. A fisherman's helper(s) may range from one to sixty depending upon the size of the vessel.

An inland fisherman may fish in one body of water or move from lake to lake. This employee works during daylight hours, usually setting out in the craft at sunrise and returning to shore at dusk.

A marine fisherman may be required to travel over great distances on the water and average being gone from home 250 days a year. This employee's hours are not limited and may amount to eighteen or twenty hours a day. In addition to fishing, fishermen are involved with vessel and maintenance chores.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Fisher, Net	441.684-010
Skiff Operator	441.683-010
Fisher, Pot	441.684-014

OCCUPATIONAL TASK: Exploring fishing with nets

OCCUPATIONAL COMPETENCY: Identifying nets and fish

RESOURCES and/or MATERIALS

1. Copies of Career Information Sheet
2. Game: "LET'S GO FISHING"
3. Student Attitude Sheets

Optional

A tape recording may be prepared earlier and played to the class of the Career Information Sheet.

OR

A colored transparency may be prepared and each section read aloud and discussed by the class.

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand the duties of a fisherman.
2. Become more knowledgeable of different types of nets and fish.
3. Appreciate people earning their livelihood as fishermen.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Discuss advantages/disadvantages of fishermen using nets for catching fish.
3. Divide class into three groups. Assign each group a different kind of fishing net to discuss. Each group should share printed information pertaining to fish with the class.
4. Distribute sheets and play game: "LET'S GO FISHING."
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Participation in class discussion and group activities.
3. Participation in game: "LET'S GO FISHING."
4. Completing the Student Attitude Sheet.

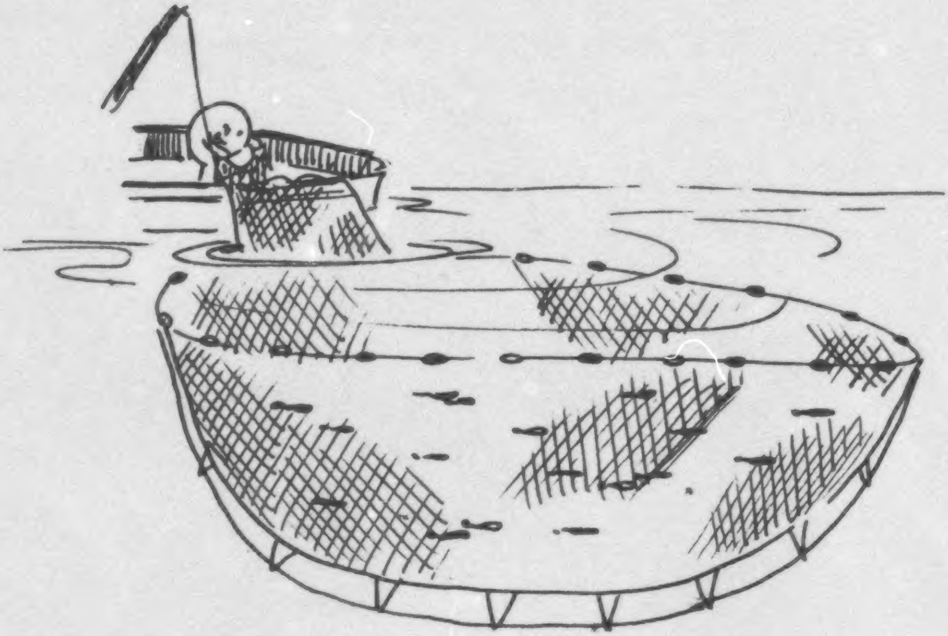
METHODS OF NET FISHING

An echo sounder is an electronic device used to locate schools of fish, especially on modern fishing vessels. The echo sounder is fixed to the bottom of the ship and sends out sound impulses every few seconds. Echoes of the impulses bounce back from the sea bottom. A school of fish shows its shadow on a screen or is recorded on a moving roll of paper with a stylus. A fishing net is lowered when the ship is positioned over the school.

This activity gives insight to three types of nets: purse seines, gill nets, and otter trawls which are used to catch a variety of fish. Examples of kinds of fish which may be captured in each net and additional facts to assist students in learning to distinguish between the varieties of fish are also included.

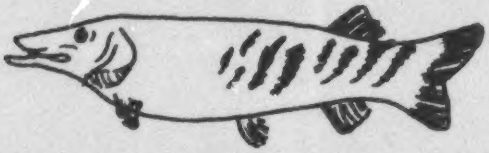
Purse Seines

About half of the United States catch is made by purse seines. The principal species captured in this net include: Menhaden, Pilchard, Salmon (Pacific), Herring, Tuna, and Mackerel.

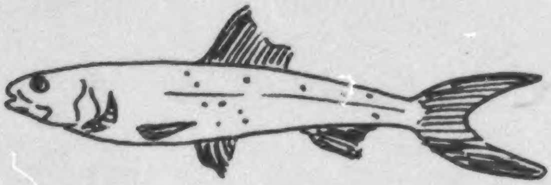


Purse Seines

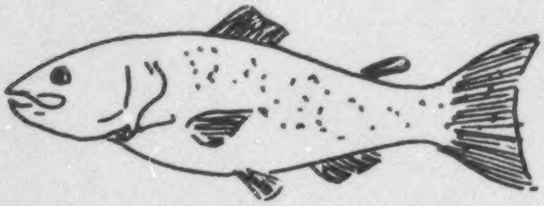
1. Menhaden - Migratory sea fish which travels in vast schools. Eggs float in the sea. Taken in greater volume by United States fishermen than any other species.



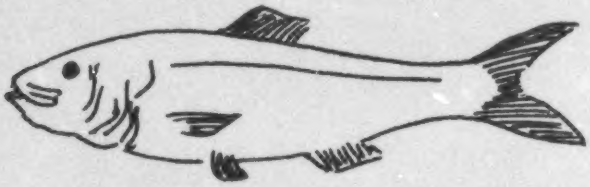
2. Pilchard - The true "sardine" belonging to the herring family. Found in great schools on Pacific Coast. Record catch of 1½ billion lbs. in one year.



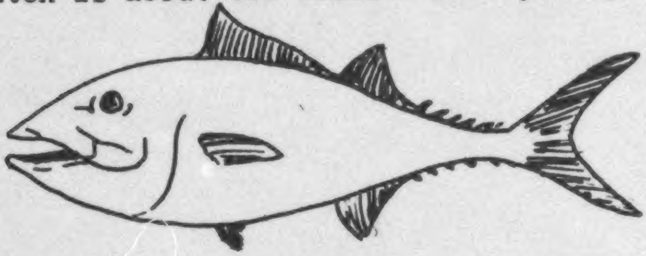
3. Salmon, Pacific - Spawns in freshwater streams and lakes and then dies. After hatching the young, spend a period in fresh water and then go to sea, returning usually in two to five years, depending on the species.



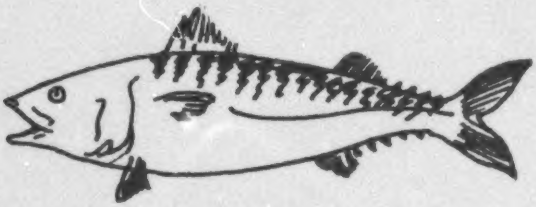
4. Herring - Schools in vast numbers near the surface. Comes into shallow water to spawn. Eggs adhere to weeds, stones, or shells. One of the world's most important food fishes.



5. Tuna - Large saltwater fish of mackerel family. Inhabits the open sea, not limited to the continental shelf. Migrates great distances. Usually travels in large schools. World catch is about two billion lbs. yearly.

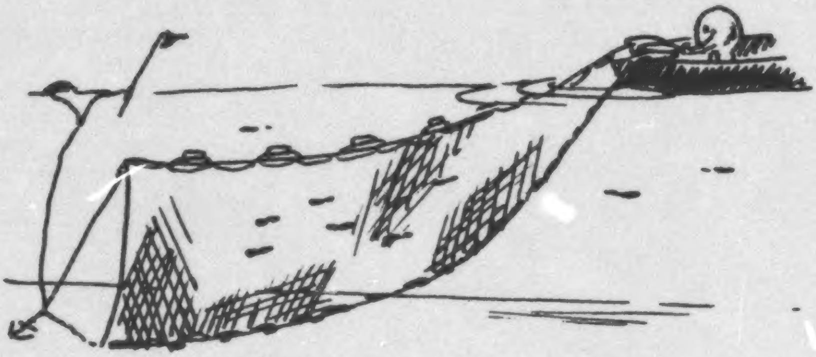


6. Mackerel - A perfectly proportioned sea fish. Travels near the surface in great schools. Found in Atlantic and Pacific Oceans. Atlantic catch used principally fresh and frozen. Most all the Pacific catch is canned.

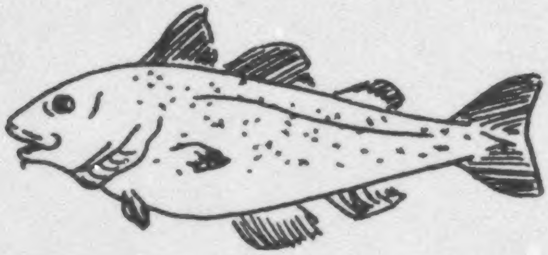


Gill Net

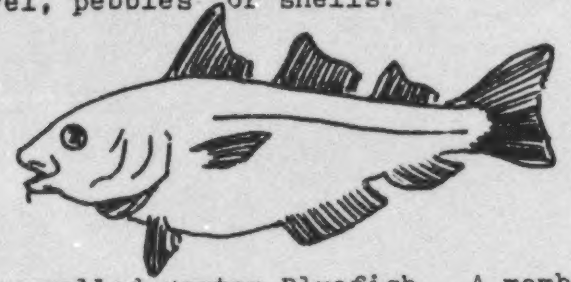
The principal species captured by gill nets include: Cod, Haddock, Pollack, Mullet, Sea Bass, Salmon, and Bluefish.



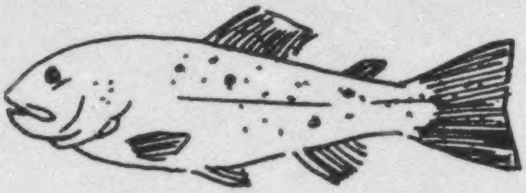
1. Cod - Strictly a coldwater fish. Sea fish with a barbel under the jaw. One of the world's chief food fishes and a rich source of liver oil for vitamins. More cod have been taken off the coast of North America than any other species. Pieces of jewelry, leather, stones, glass, or almost anything that may have been dropped overboard have been found in the stomachs of codfish.



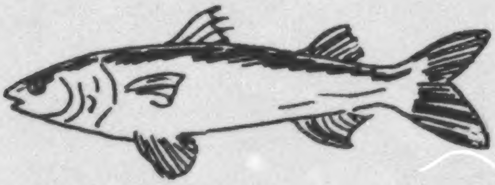
2. Haddock - A close relative of the cod. Lives deeper than cod and remains closer to bottom. Prefers bottom composed of smooth, hard sand, gravel, pebbles or shells.



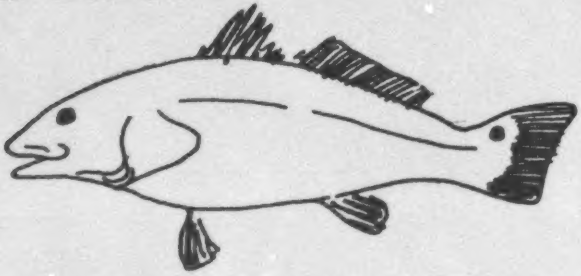
3. Pollack - Often called Boston Bluefish. A member of the cod family. Fierce, aggressive fish of Atlantic and Pacific coastal waters. It prefers shallow waters.



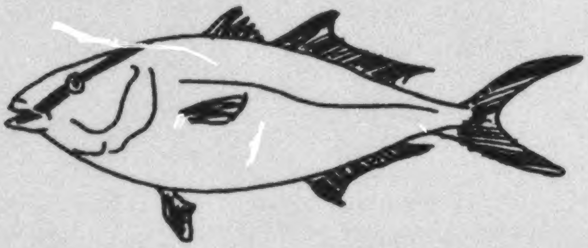
4. Mullet - Largely tropical fish of worldwide distribution. Closely related to the barracuda. Can be raised in ponds. About three fourths of the United States catch is taken in Florida.



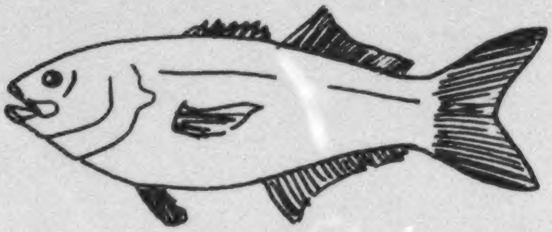
5. Sea Bass - Lives in shallow waters in sea. Ascends rivers to spawn, prepares nests, and takes great care of young. Introduced from the Atlantic into the Pacific.



6. Salmon - Spawns in freshwater streams and lakes and then dies. After hatching the young, spend a period in fresh water and then go to sea, returning usually in two to five years, depending on the species.

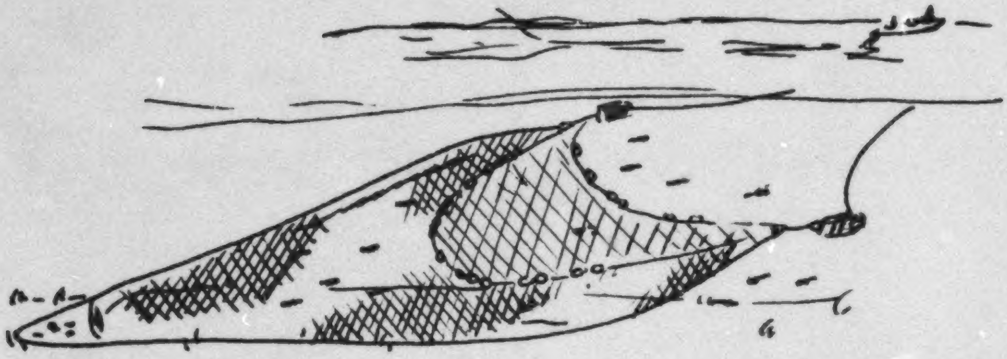


7. Bluefish - A saltwater fish. A warmwater species. Migrates up and down Atlantic Coast from Florida to Massachusetts.

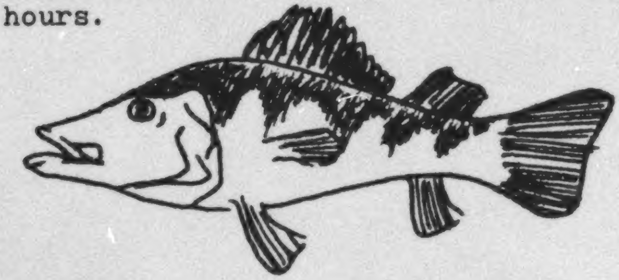


Otter Trawl

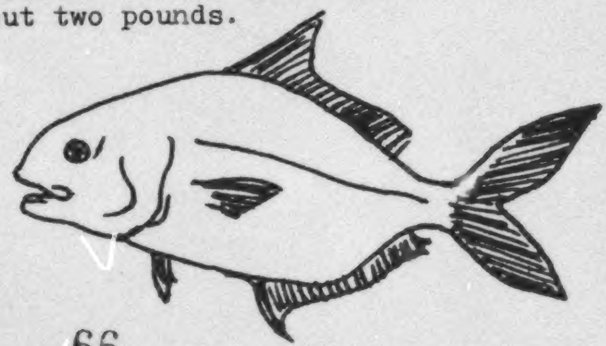
Examples of fish captured by using an otter trawl are: Ocean Perch, Pompano, Porgy, Salmon, Mullet, Sea Bass, and Lafayette.



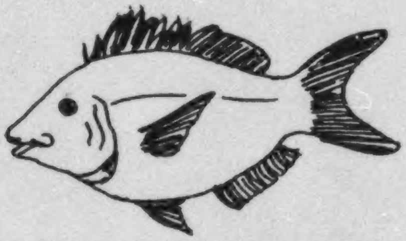
1. Ocean Perch - Eggs develop and hatch within the body of the mother. The principal food fish taken by Atlantic Coast fishermen. Fish can be taken with trawls only during daylight hours.



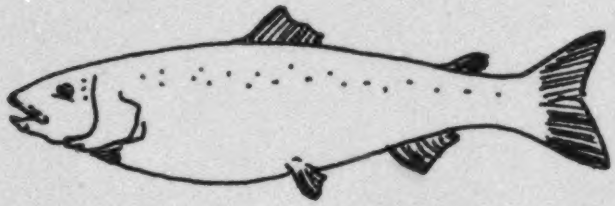
2. Pompano - Has a flat, oval body, which has a silvery, metallic color. Found along the coast of the South Atlantic and in the Gulf of Mexico. Averages about two pounds.



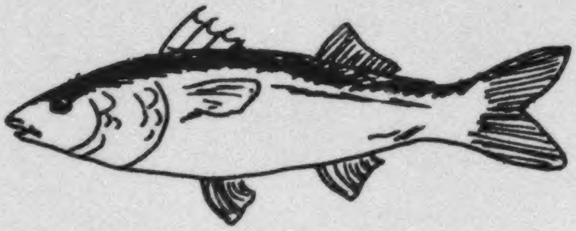
3. Porgy - Also known as Fair Maid. *Sand porgies* are found in bays, where they prefer sand bottoms. *Sea porgies* are found in deep water, where they feed over wrecks and rocky places. Both fish are bottom feeders and congregate in schools.



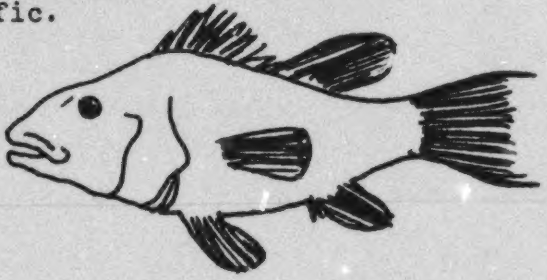
4. Salmon - Spawns in freshwater streams and lakes and then dies. After hatching the young, spend a period in fresh water and then go to sea, returning usually in two to five years, depending on the species.



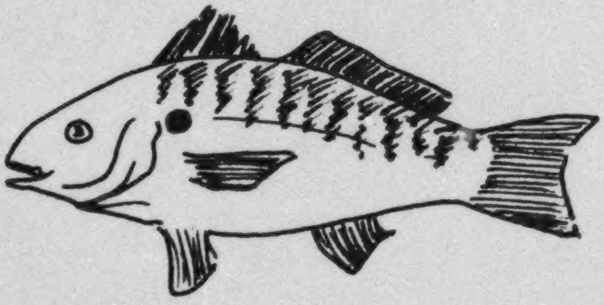
5. Mullet - Largely tropical fish of worldwide distribution. Closely related to the barracuda. Can be raised in ponds. About three fourths of the United States catch is taken in Florida.



6. Sea Bass - Lives in shallow water in sea. Ascends rivers to spawn, prepares nests, and takes great care of young. Introduced from the Atlantic into the Pacific.



7. Lafayette - Also known as Spot, Goody, and Old Wife. Has silvery body, with fifteen oblique, dark bars on the sides. There is a black spot behind the shoulders. Lafayettes are small, seldom weighing more than a few ounces.



TIDBITS ABOUT FISH

Cut each numbered section apart. Read the information part aloud to the class and see if they can complete the FISH game. The winner is the first person to completely fill all spaces.

1. Menhaden - Eggs float in the sea. Taken in volume by U.S. fishermen more than any other species.

2. Salmon - Spawns in freshwater streams and lakes and then dies.

3. Herring - Eggs adhere to weeds, stones, or shells.

4. Haddock - Prefers living on bottom of water composed of smooth, hard sand, gravel, pebbles, or shells.

5. Mackerel - A perfectly proportioned sea fish. Found in Atlantic and Pacific Oceans.

6. Cod - Strictly a coldwater fish. More of these have been caught off the coast of North America than any other species.

7. Pollack - Often called Boston Bluefish. Fierce, aggressive fish of Atlantic and Pacific coastal waters.

8. Ocean Perch - Eggs develop and hatch within the body of the mother. Captured with trawls only during daylight hours.

9. Porgy - Also known as Fair Maid.

10. Sea Bass - Ascends rivers to spawn, prepares nests, and takes great care of young.

11. Pompano - Has a flat, oval body, which has a silvery, metallic color.

12. Tuna - Travels great distances. World catch is about two billion lbs. yearly.

13. Pilchard - The true "sardine" belonging to the herring family.

14. Mullet - Closely related to the barracuda. Can be raised in ponds.

15. Bluefish - A warmwater species fish that migrates up and down Atlantic Coast from Florida to Massachusetts.

16. Lafayette - Also known as Spot, Goody, and Old Wife. Small, seldom weighing more than a few ounces.

"LET'S GO FISHING"

The sixteen kinds of fish should be written on the board for students to choose from as each statement is read about each different kind of fish. Each fish title should be pronounced and spelled aloud so that students may become familiar with the various kinds of fish selected for the game.

All sixteen spaces must be correctly written in with the correct title in order for a winner. Good luck with your "catch" of fish!

	F	I	S	H	
F	8.	1.	10.	6.	F
I	12.	5.	9.	14.	I
S	2.	13.	7.	16.	S
H	3.	15.	11.	4.	H
	F	I	S	H	

LET'S GO FISHING - KEY

	F	I	S	H	
F	Ocean Perch	Menhaden	Sea Bass	Cod	F
I	Tuna	Mackerel	Porgy	Mullet	I
S	Salmon	Pilchard	Pollack	Lafayette	S
H	Herring	Bluefish	Pompano	Haddock	H
	F	I	S	H	

Name ______________________________

Occupational Cluster Marine/Fresh Water - Fisher, Net

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it
Class discussion of advantages/disadvantages for using nets to catch fish					
Playing game: LET'S GO FISHING					
Group activities pertaining to Methods of Net Fishing					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Fly Tier

DOT CODE: 732.684-074

DUTIES:	A fly tier makes artificial fish flies and lures, using feathers, fur, thread, and fishhooks, according to a prototype design. S/He clamps fishhook in a special fly-tying vise and wraps thread around the shank or hook. Next, the worker pulls feathers or fur of a specified color or type from a quill or pelt, positions on hook, and wraps in place with thread. This operation is repeated to simulate the wings, legs, and tail of the insect. S/He wraps thread or colored wire around the shank or hook in continuous spirals to form the body of the insect. The threads are then tied and cut from the newly formed insect. Lastly, the assembler may brush dope on windings to waterproof and hold them in place.
WHERE EMPLOYED:	A person seeking employment as a fly tier should make applications with companies that make artificial flies and other fishing equipment. Some people are self employed as fly tiers and sell flies directly to a store.
EMPLOYMENT OUTLOOK:	The employment outlook is expected to be favorable during the 1980's. Many people enjoy fishing as a sport and may choose artificial baits to attract fish.
EDUCATION AND TRAINING:	A high school education is preferred by employers hiring people to work as fly tiers. On-the-job training may be obtained through part-time jobs during busy seasons.

SPECIAL QUALIFICATIONS:

Aspirants should be able to work easily with their hands and have good eyesight. It is imperative that these employees be able to read and follow patterns when making a variety of flies.

It is also important that this worker be able to exercise patience and work productively when assigned a position whereby s/he is working alone.

EARNINGS AND ADDITIONAL BENEFITS:

Persons working as fly tiers are paid for the number of flies they make. A rate of pay is established for each kind of fly produced. Usually more is paid for flies that are hard to make, while less is earned for easy flies. Earnings also depend on how fast the work is done. Some fly tiers average earning the Federal minimum wage while others may earn more because of the rapidity with which they produce flies.

WORKING CONDITIONS AND LIFESTYLES:

Usually the fly tier works in a clean, quiet, and well-lighted setting. S/He may sit down or stand to perform the tasks necessary to make the flies.

The working hours may vary. As a rule, workers complete 40 hours a week and may be more busy during the winter and early spring months.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Fly Tier	732.684-074
Fishing-Rod Assembler	732.684-066
Fishing-Reel Assembler	732.684-062

OCCUPATIONAL TASK: Exploring flies used for fishing

OCCUPATIONAL COMPETENCY: Distinguishing between wet and dry flies

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Transparency of "Materials Used in Making Flies"
3. Self-Inventory
4. Student Attitude Sheets

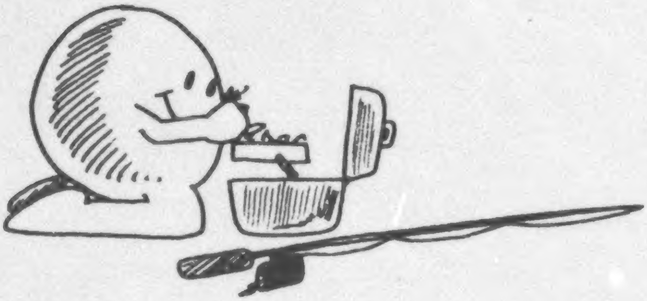
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand artificial baits used in catching fish.
2. Distinguish between wet and dry flies.
3. Realize the variety of materials used in making flies.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Read "Materials Used in Making Flies."
3. Draw a pattern illustrating a fly.
4. Collect samples of flies or pictures of flies to share with the class.
5. Complete the Self-Inventory.
6. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Reading "Materials Used in Making Flies."
3. Drawing a pattern illustrating a fly.
4. Sharing samples or pictures of flies with the class.
5. Completing the Self-Inventory.
6. Completing the Student Attitude Sheet.

"Materials Used in Making Flies"

1. Table or desk on which to work

2. A good light

3. A special fly-tying vise to hold the hook in place

4. Hooks used as base for tying different flies

5. Materials used for tying:
    a. Silk thread
    b. Wool yarn
    c. Metal threads
    d. Deer tail hairs
    e. Squirrel, fox, and rabbit fur
    f. Colored chicken, peacock, and duck feathers

6. Beeswax to rub over threads

7. Hackles are feathers from the neck of a bird.

8. Cork may be used with feathers or fur to assist in floating.

9. Scissors for cutting

From these materials two types of flies are made: wet flies, which sink in the water, and dry flies, which float on the water.

Self-Inventory

Read each statement carefully and respond with either YES or NO in the space provided before each number.

________ 1. I enjoy making things with my hands.

________ 2. I can read well.

________ 3. I can follow directions given orally, written, and/or illustrated with pictures.

________ 4. I have good eyesight.

________ 5. I have been enrolled in sewing, art, and/or a craft course during the past two years.

________ 6. I have a lot of patience.

________ 7. I can work well alone or in a group.

________ 8. I prefer to work in a clean, quiet, and well-lighted environment.

________ 9. I would be willing to work for a Federal minimum wage.

________10. I prefer a job that would allow me to choose either to sit or stand while working.

If you responded with YES to all the statements, you might like to work as a Fly Tier.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Fly Tier

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Becoming knowledgeable of "Materials Used in Making Flies"					
Completing the Self-Inventory					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Live Bait Supplier

DOT CODE: 529.687-086

DUTIES:

The duties of the live bait supplier vary according to the type and size of the business chosen. Live bait includes minnows, worms, insects, small fish, frogs, crayfish, shrimp, crabs, crickets, grasshoppers, or a combination of all or any of them.

If the live bait supplier raises his/her own minnows, s/he is responsible for fertilizing the pond, stocking it with adult minnows, artificial feeding, harvesting minnows, estimating production, grading, transporting and holding minnows, controlling weeds by spraying and applying chemical agents, treating and controlling diseases, and controlling predators and pests.

Some live bait suppliers raise worms in large containers indoors and feed them various worm foods while crayfish are caught by placing a minnow net across a stream and then turning over the stones in front of the net.

These workers may sell a lot of their stock over the counter and/or transport various kinds of live bait to fishing areas throughout a state or across state lines. Suppliers may have to figure transportation costs in terms of the volume of sales.

WHERE EMPLOYED:

Persons aspiring to work as live bait suppliers should find employment opportunities with larger private industries who distribute live bait nationwide. Some people may choose to operate as a self-employed supplier at a small roadside stand.

EMPLOYMENT OUTLOOK:

The employment outlook is expected to be moderately good as the average worker's amount of leisure time grows. Employment opportunities are not always readily available, and the person who starts a business faces stiff competition.

EDUCATION AND TRAINING:

A high school education is recommended for a live bait supplier. Specific vocational preparation is highly desired by employers. Experience in some phase of the bait business is of great value to the individual entering this field. Some experiences may be obtained by working at a fish hatchery, by working as a dock hand at a private resort, or by working as a summer employee of the National Park Service.

Some persons with financial means and suitable sites may start a bait supply business on a limited scale and learn by doing.

A college education may prove tremendously helpful to live bait suppliers if courses in biology, economics, accounting, taxes, and administration have been part of the program of studies.

SPECIAL QUALIFICATIONS:

These employees must have the ability to follow instructions and be enjoying good health. Good eyesight, hearing, finger and manual dexterity, and appreciation for animal life are necessary for live bait suppliers. Lastly, in marketing their products, these workers may come in contact with the public; consequently, they should have the ability to meet and work well with others.

The operator of a minnow hatchery must have a permit or license issued by the state fish and game department. A license for "taking and transporting" bait also is required.

EARNINGS AND ADDITIONAL BENEFITS:

Earnings for a live bait supplier vary according to the employer. Workers employed by live bait supply businesses sometimes are paid for piecework. When pay is received for piecework, each employee who packs bait grubs in cans is paid according to the number of cans filled.

Persons who are self-employed may earn a modest yearly income. Individuals who operate on a large scale and deal in many kinds of live bait can and do earn substantial incomes.

WORKING CONDITIONS AND LIFESTYLES:

Much of the work performed by a live bait supplier is done out-of-doors. Atmospheric conditions for minnow supplying and frog farming are wet and humid.

The bait supplier can work for another person who owns the business or can be self-employed. During some months, an employee of a bait supply shop may have to work extra hours and weekends.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

Live Bait Supplier	529.687-086
Fish-Bin Tender	529.687-082
General Helper	529.687-094
Fish Grader	529.687-098

OCCUPATIONAL TASK: Examining natural baits

OCCUPATIONAL COMPETENCY: Identifying baits for fresh and salt water fishing

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A.
3. Activity Sheet B.
4. Student Attitude Sheet

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Recognize baits furnished by nature.
2. Discuss hints for collecting live bait.
3. Determine the advantages and disadvantages when working as a live bait supplier.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet pertaining to live bait supplier.
2. Plan an inventory for fresh and salt water live bait suppliers.
3. Complete Activity Sheet A.
4. Complete Activity Sheet B.
5. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Completing an inventory for live bait suppliers with respect to fresh and salt water fishing.
3. Completing Activity Sheets A and B.
4. Completing the Student Attitude Sheet.

INVENTORY FOR LIVE BAIT SUPPLIERS KEY

"Natural Baits for Fresh Water Fishing"

1. Caterpillars
2. Crayfish
3. Crickets
4. Cut Bait (perch belly, etc.)
5. Darters
6. Dragonflies
7. Earthworms
8. Freshwater Shrimp (scud)
9. Frogs
10. Grasshoppers
11. Grubs
12. Hellgrammites
13. Minnows
14. Newts
15. Nightcrawlers
16. Nymphs
17. Salamanders
18. Salmon eggs
19. Suckers
20. Sculpins
21. Wasp larvae

Activity Sheet A

Below is a list of fish. As a live bait supplier, suggest a natural bait to be used by anglers planning to fish in fresh waters.

1. Bass, largemouth: ______________________
2. Bass, smallmouth: ______________________
3. Carp: ______________________
4. Catfish: ______________________
5. Muskellunge: ______________________
6. Perch: ______________________
7. Pickerel: ______________________
8. Pike: ______________________
9. Rock Bass: ______________________
10. Salmon: ______________________
11. Sturgeon: ______________________
12. Trout: ______________________
13. Walleyes: ______________________
14. White Bass: ______________________
15. Whitefish: ______________________

Activity Sheet A - Key

Some fish can be caught by several different types of live bait. The following is only a sampling of live baits that can be used. These are suggestive live baits to be used by anglers. Students may perhaps identify live baits which they have found to be successful in catching fish.

1. Minnows, nightcrawlers, grasshoppers, etc.
2. Minnows, hellgrammites, salamanders, etc.
3. Doughballs
4. Earthworms, nightcrawlers, newts, etc.
5. Nightcrawlers, frogs, suckers, etc.
6. Minnows, crickets, grubs, nymphs, etc.
7. Minnows, salamanders, darters, etc.
8. Minnows, frogs, suckers, cut bait (perch belly)
9. Minnows, crickets, grubs, newts, wasp larvae, etc.
10. Salmon eggs
11. Nightcrawlers
12. Minnows, earthworms, nightcrawlers, grubs, etc.
13. Minnows, crayfish, frogs, darters, sculpins, etc.
14. Earthworms, dragonflies
15. Earthworms

INVENTORY FOR LIVE BAIT SUPPLIERS - KEY

"Natural Baits for Salt Water Fishing"

1. Anchovy
2. Bait fish
3. Balao
4. Bonito
5. Butterfish
6. Clam
7. Conch
8. Crab
9. Cut bait
10. Dolphin
11. Eel
12. Herring
13. Killie
14. Mackerel
15. Mossbunker
16. Mussel
17. Mullet
18. Sand bugs
19. Sardine
20. Sea worm
21. Shrimp
22. Smelt
23. Sparing
24. Spearing
25. Squid

Activity Sheet B

As a live bait supplier, indicate in the blanks below the kinds of bait that you would recommend for anglers fishing in salt water.

1. Barracuda: ______________________
2. Bass, California kelp: ______________________
3. Bass, channel: ______________________
4. Bluefish ______________________
5. Codfish ______________________
6. Croaker ______________________
7. Eel ______________________
8. Flounder, summer ______________________
9. Haddock ______________________
10. Mackerel ______________________
11. Perch, white ______________________
12. Pollack ______________________
13. Pompano ______________________
14. Snapper, red ______________________
15. Tuna, bluefin ______________________

Activity Sheet B - Key

The following is a sampling of live baits that can be used to catch fish while fishing in salt water areas. This information is a suggestion to be used in completing Activity Sheet B.

1. Bait fish
2. Sardine, anchovy, clam, mussel, sea worm, etc.
3. Mullet, mossbunker, crab, clam, etc.
4. Rigged eel, cut bait, butterfish
5. Clam, crab, cut bait
6. Sand bugs, mussel, clam, sardine, sea worm, etc.
7. Killie, clam, crab, sea worm, spearing, etc.
8. Squid, sparing, sea worm, clam, killie, smelt, etc.
9. Clam, conch, crab, cut bait
10. Bait fish
11. Sea worm, shrimp, sparing
12. Squid strip, clam
13. Sand bugs
14. Shrimp, mullet, crab
15. Mackerel, flying fish, bonito, squid, dolphin, herring, cut bait, etc.

Name ____________________

Occupational Cluster Marine/Fresh Water - Live Bait Supplier

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with Live Bait Supplier information					
Planning an inventory for Live Bait Suppliers					
Matching baits with fish					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Net Maker	DOT CODE: 789.684-030
DUTIES:	A net maker interlaces and knots twine to form nets. S/he selects gage and twine according to size specified on work order. Twine is wrapped around needle (twine holder) to facilitate interlacing and knotting of twine. The net maker extends and ties the ends of the foundation line to poles. S/he ties twine to the end of line with clove hitch and positions the gage against the line. Next, the net maker loops twine around the gage and knots twine onto foundation line, forming a half mesh. The gage is removed and the same operation repeated to form a row of half meshes. S/he holds gage against half-mesh, pulls twine around gage, and ties sheep bend knot onto half-mesh, forming mesh. This operation is repeated with succeeding half meshes to form net.
WHERE EMPLOYED:	People aspiring to work as net makers for marine science occupations should seek employment in Coastal Regions where private industries provide some opportunities for work. Some net makers work independently when they identify fishermen who need nets repaired and a wage agreement can be negotiated between the two parties.
EMPLOYMENT OUTLOOK:	The employment outlook for net makers is expected to be good throughout the 1980's. Some companies in the Coastal Region produce nets for a worldwide market distribution. Some job openings are expected to arise because of the need to replace experienced workers who retire, die, or transfer to other occupations.

EDUCATION AND TRAINING: A high school diploma is preferred. The best way to enter this trade is to start as a helper in a net-making shop and learn on the job. Helpers learn by making nets under the direction of experienced workers. Much time and practice are needed to learn complex tasks such as measuring and cutting the new net materials and interlacing and knotting twine to form nets with a minimum of waste.

Inexperienced persons should take advantage of basic training in net making from vocational or high school courses. However, additional training and experience in a shop usually are required before these workers can work as quickly and efficiently as experienced net makers.

SPECIAL QUALIFICATIONS: Persons interested in becoming net makers should have good manual dexterity, hand-eye coordination, and be able to stand for longer periods of time.

EARNINGS AND ADDITIONAL BENEFITS: Beginning salaries for net makers are usually at the Federal minimum wage per hour. However, employees may receive higher wages as they become more productive. Net makers who are self-employed may receive an amount of pay which is agreed upon by the net maker and customer.

WORKING CONDITIONS AND LIFESTYLES: Net makers employed by private companies usually work a regular five-day, 40-hour week; however, overtime may be necessary when large demands for nets are present.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

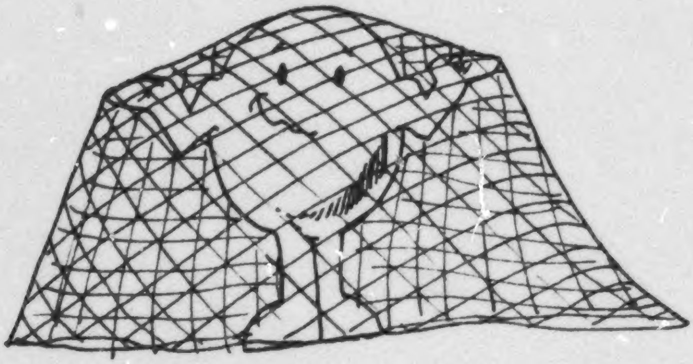
REPRESENTATIVE JOB TITLES:	Net Maker	789.684-030
	Canopy Stringer	789.684-018
	Net Repairer	449.664-010

OCCUPATIONAL TASK: Exploring fish net making

OCCUPATIONAL COMPETENCY: Creating a pattern to be used in making a net

RESOURCES and/or MATERIALS

1. Career Information Sheets
2. Information Sheet A: Net Making
3. Student Attitude Sheets



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Be more familiar with the work of a net maker.
2. Better determine if this type of work would be interesting to you.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Read the Information Sheet A: Net Making.
3. Study Information Sheet B.
4. Sketch a drawing of a net for catching fish using a gore net method.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Reading the Information Sheet A: Net Making.
3. Sketching a drawing of a net for catching fish and submitting it to the teacher.
4. Completing the Student Attitude Sheet.

INFORMATION SHEET A

Net Making

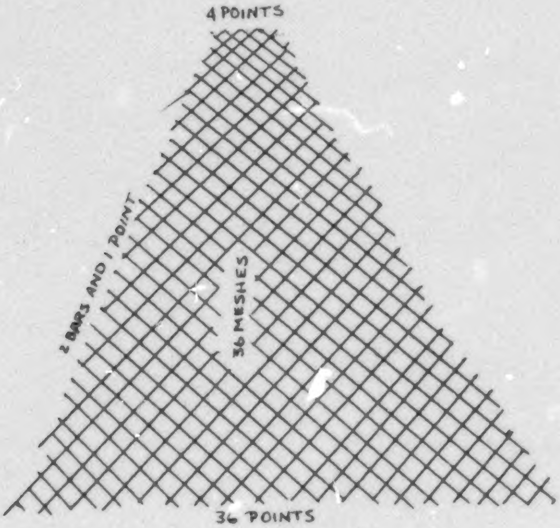
A fishing net can be cast over fish by a fisherman wading in shallow water, or may be cast from shore, dock, or boat. A lot of practice and patience by fishermen is needed to spread a fishing net perfectly for a good catch of fish. Judging the speed and direction of travel of a fish when it whirls the water in the fisherman's vicinity is an art.

The art of net making has been handed down from father to son and requires a great amount of skill and time. The netting can be made of linen, silk, cotton, or nylon and other synthetic materials. Though cotton netting requires more care (thorough washing and drying before storing) than synthetic materials, in many instances it outlasts them, since it does not cut or chafe as easily on shelly or rocky bottom. The mesh size, size of twine, and length of net depend on the species of fish to be caught and the preference of the fisherman. However, because of the lack of standardization in measuring twine, a fisherman may have some difficulty in purchasing a desirable size.

INFORMATION SHEET B

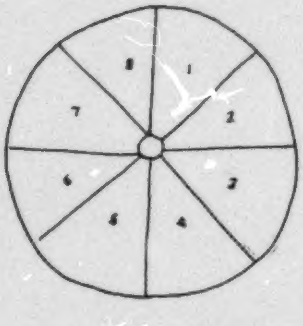
Gore Net Method

A gore net is made by cutting eight tapered (wedge-shaped) sections (gores) from machine-knitted netting.

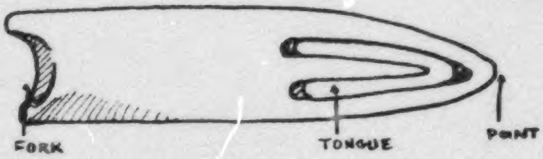

4 POINTS
2 BARS AND 1 POINT
36 MESHES
36 POINTS

Section of gore net

After the eight gores are cut out, a net needle is used to sew the gores together to form a disk.



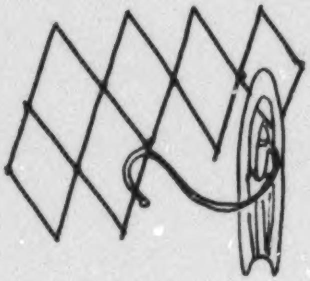
Gore net layout

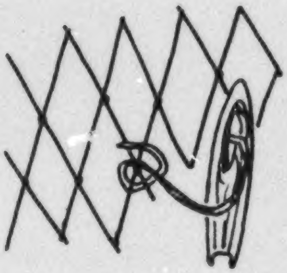

FORK
TONGUE
POINT

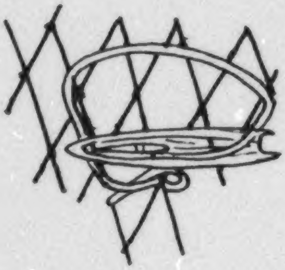
Net needle

The needle is a simple tool for holding the twine while the sewing is being done and is pointed on one end so that it can easily pass through the desired mesh. The net needle is filled by taking several turns around the base of the tongue with the end of the sewing twine; winding the twine down the side, around the fork, up the opposite side, then around the tongue, and back to the other side. The winding should be continued until the needle is full.

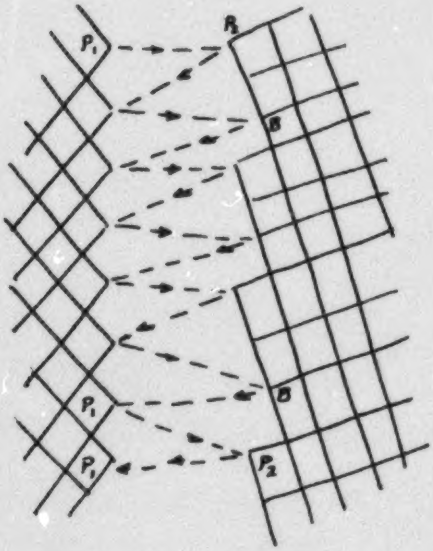
The following are illustrations sewing and tying knots in net making:





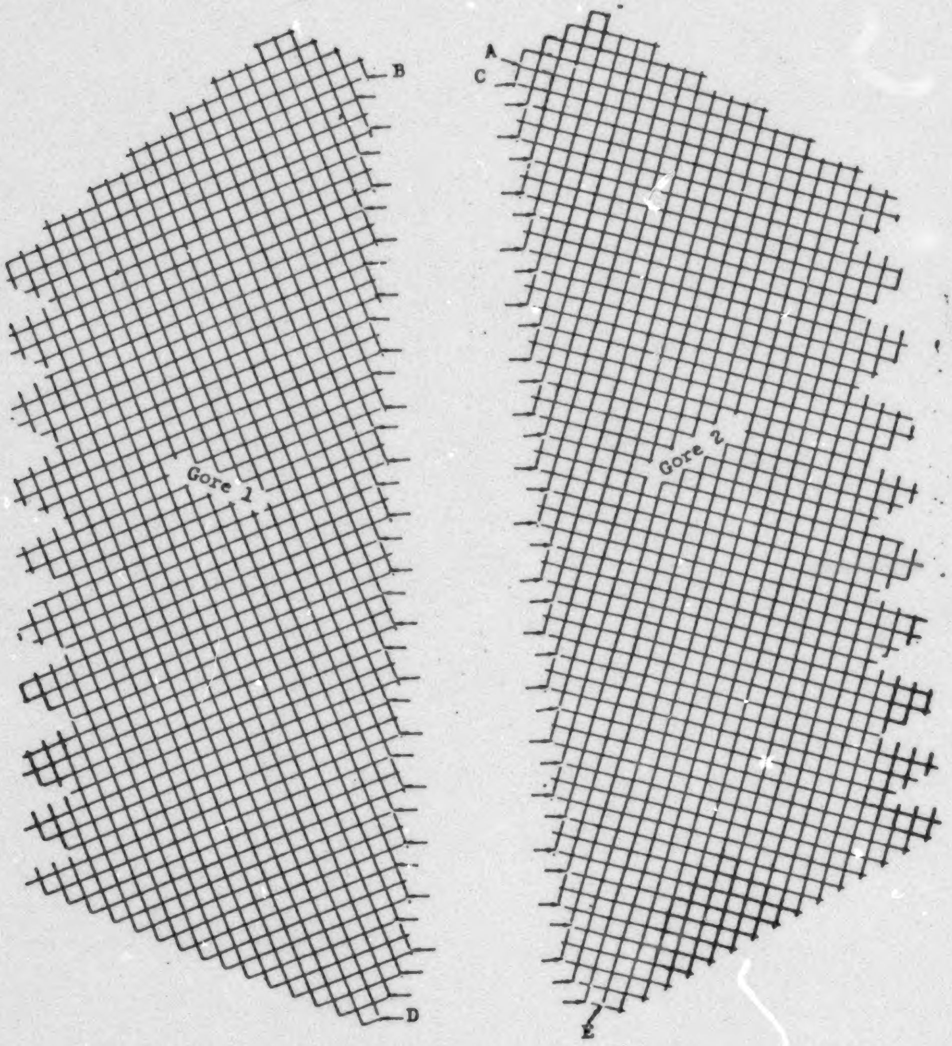


All eight sections of netting are sewed together as follows:



Tie the end of the sewing twine on at point A, leaving two inches of sewing twine, then tie on at point B. Next tie on at point C, leaving one inch of sewing twine between knots B and C. Leave one inch of sewing twine between all knots from B to D. Leave two inches of sewing twine between knots D and E.

The sewing twine zigzags from gore 1 to gore 2. Gore 3 is sewed to gore 2 the same as gore 2 is sewed to gore 1 and so on until gore 8 is sewed to gore 1.



Name ______________________________

Occupational Cluster Marine/Fresh Water - Net Maker

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Reading Information Sheet: Net Making					
Sketching a drawing of a net for catching fish					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Net Repairer DOT CODE: 449.664-010

DUTIES: Net repairers assemble and repair nets on shore and aboard ship. The process used in repairing nets consists of assembling, tying, and adjusting various webbing material, floats, weights, rings, and ropes to make gill nets, purse seines, reef nets, and trawls, by using a knife and twine-filled bobbin shuttle. These workers hoist the fishing net into the ship's rigging to dry after the fishing operations, using a block and tackle, while repairing the holes and tears in the webbing. They may also give directions to other workers engaged in taking down nets. From time to time, they may retrieve lost nets from the water. Occasionally, net repairers get to participate in fishing.

WHERE EMPLOYED: Persons aspiring to work as net repairers in marine science occupations should seek employment in Coastal Regions where private industries provide some opportunities for work. Some net repairers may choose to work independently wherever they find fishermen who need nets repaired and a wage agreement can be negotiated between the two parties.

EMPLOYMENT OUTLOOK: The employment outlook for net repairers is expected to be good throughout the 1980's. Some jobs are expected to arise because of the need to replace experienced workers who retire, die, or transfer to other occupations.

EDUCATION AND TRAINING:

A high school diploma is preferred. The best way to enter this trade is to start as a helper in a net-making shop and learn while on the job. Helpers learn by making nets under the direction of experienced workers.

Courses in net-making/net repairing are offered in some vocational and high school settings. However, additional training and experience in a shop usually are necessary in order for workers to become proficient in net repairing.

SPECIAL QUALIFICATIONS:

Persons interested in repairing nets should have good manual dexterity, hand-eye coordination, and be able to stand for longer periods of time.

EARNINGS AND ADDITIONAL BENEFITS:

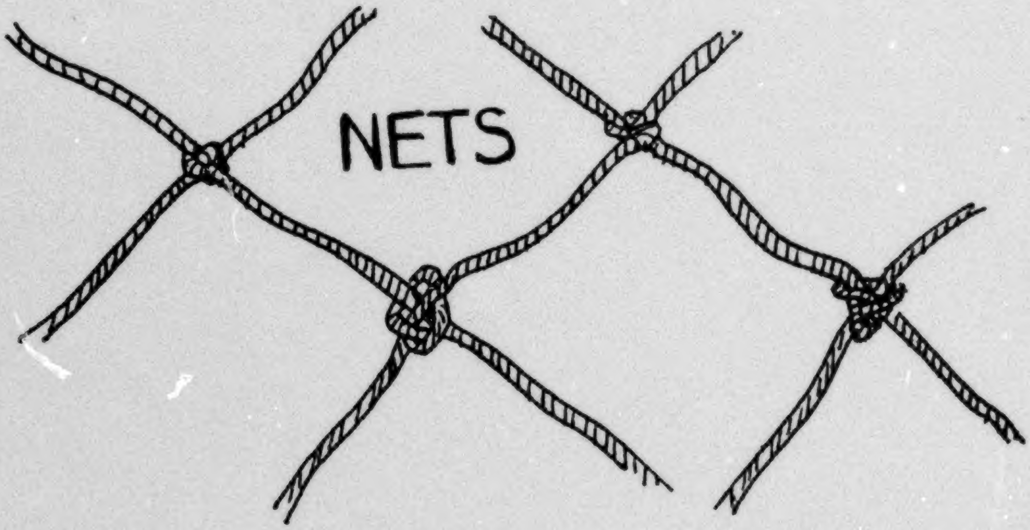
Net repairers may experience beginning salaries to be a Federal minimum wage per hour worked. However, employees may receive higher wages as they become more productive. Net repairers who are self employed may receive an amount of pay which is agreed upon by the repairer and person(s) wanting the work completed.

WORKING CONDITIONS AND LIFESTYLES:

Net repairers employed by private companies usually work a regular five-day, forty-hour week; however, overtime may be necessary when large demands for net repairs are present.

Persons who are employed to travel aboard boats for the purpose of repairing nets may experience being away from home for several days at a time and having to work under various weather conditions.

NETS



Nets are simply open cloth, or fabrics, of meshes which are made by knotting or twisting threads of cotton, linen, hemp, silk, or rayon into squares. Silk or rayon nets are very fine nets, made like the wire netting used to fence poultry yards. In the past, nets were hand-woven, but now they are made on looms.

Because the fishing nets are essential to the fisherman's successful catch of fish, they must be thoroughly checked and repaired before each fishing season and throughout the busy work schedule. In fact, repairing nets is the fisherman's constant chore.

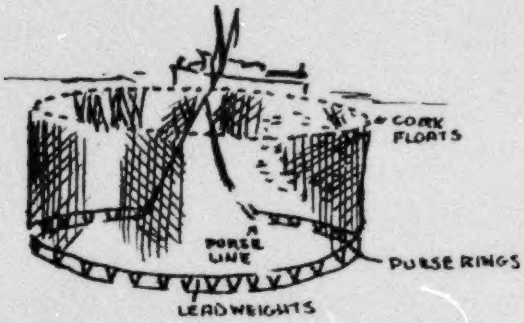
The main kinds of nets used for fishing and which may need repairing include the following:

a. Drift: A drift net is square. It is not weighted and floats in the water.

b. Gill net: A gill net catches and holds fish when they stick their heads through the mesh. Nets are made of cotton, nylon, or linen thread.

c. Kettle or Weir: These nets are fixed on stakes and placed along the coast between high and low water.

d. Seine: A seine net is used near a shore. Most of the time this net is very long and rather narrow. When functioning properly, it hangs straight up and down in the water. Seine nets are used for menhaden and mackerel fishing in the East and for tuna, sardines, and salmon in the West. They are complex and hard to put together. A single purse seine may require miles of strong rope, thousands of sinkers, and thousands of big cork, wood, glass, or plastic floats. Net makers, net repairers, and/or fishermen sew together the edges of the narrow strips of webbing which make up the purse seine. The captured fish are contained in the net by pulling a drawstring at the bottom of the net. See picture below.



e. Trammel: A trammel net is a set of three nets staked at top, bottom, and sides. The two outer nets have large meshes and are stretched tight. The middle one is of fine mesh and hangs loose. When functioning properly, all three hang straight up and down. Unaware that a trap is waiting for them, the fish pass through the coarse net easily. However, when the fish try to force their way through the fine net, they are caught in a pocket.

f. Trawl: The trawl net is like a huge pocket. It is weighted and is dragged along the bottom of the stream. The mouth of the net where the fish enter is kept open by wooden beams or metal frames as it is dragged along through the water.

Hopefully, this information has helped to make us aware that net making and net repairing are necessary occupations until better methods can be available for catching those items of food from streams, rivers, and oceans which are essential for our diets.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Fishery

REPRESENTATIVE JOB TITLES:

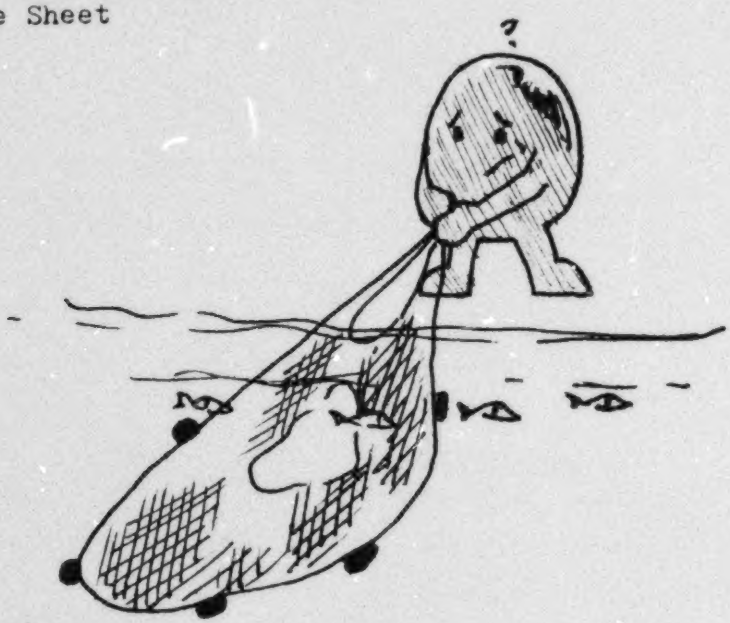
Net Repairer	449.664-010
Fisher, Net	441.684-010
Deckhand, Fishing Vessel	449.667-010
Skiff Operator	441.683-010

OCCUPATIONAL TASK: Repairing nets

OCCUPATIONAL COMPETENCY: Identifying and tying knots

RESOURCES and/or MATERIALS

1. Nylon rope 1/8" diameter x 100 feet
2. Bunsen burner
3. Types of Knots: Handout Sheets A and B
4. Student Attitude Sheet



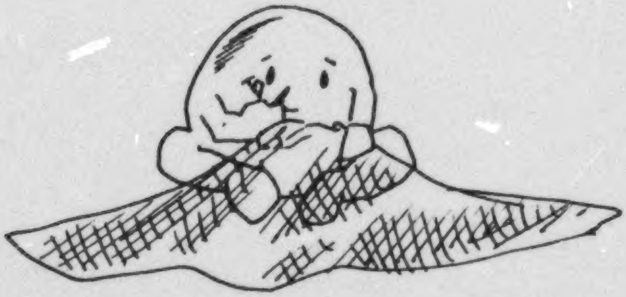
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize more the importance of good finger dexterity in repairing fishing nets.
2. Determine if you prefer to learn more about repairing nets.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Review Handout Sheets A and B and select at least three knots to tie.
3. Practice tying knots. Ask instructor for help when needed.



EVALUATION PROCEDURES

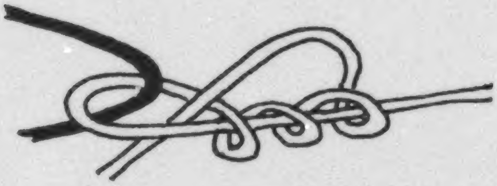
Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Reviewing Handout Sheets A and B.
3. Participating in tying knots.
4. Completing Student Attitude Sheet.

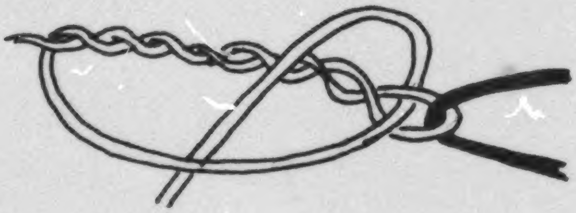
TYPES OF KNOTS

Handout Sheet A

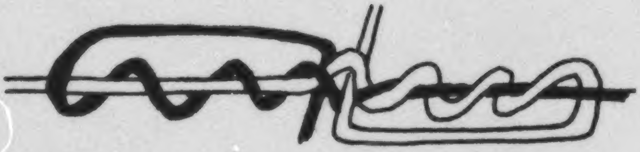
Reef Knot or
Clinch Knot



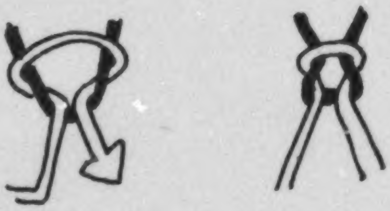
Improved
Clinch
Knot



Blood
Knot



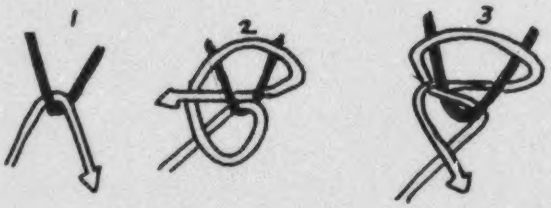
Reef or
Flat Knot



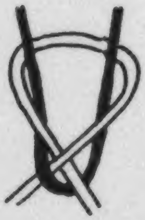
TYPES OF KNOTS

Handout Sheet B

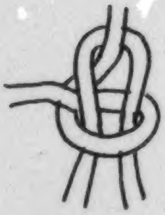
Netting Knot or Mesh Knot



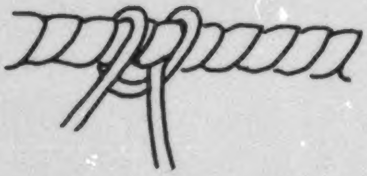
Clove Knot



Sheet Bend



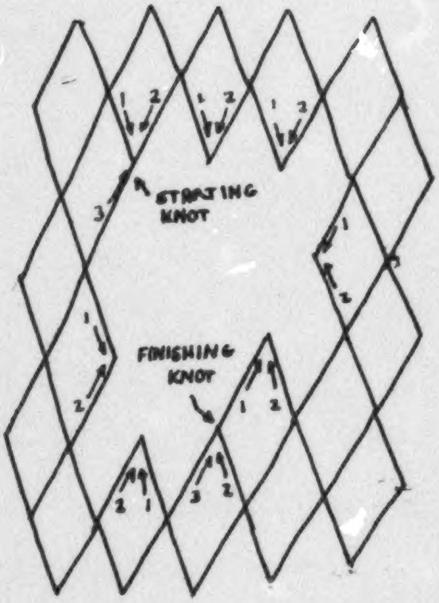
Clove Hitch



Illustrations of Net Repairing

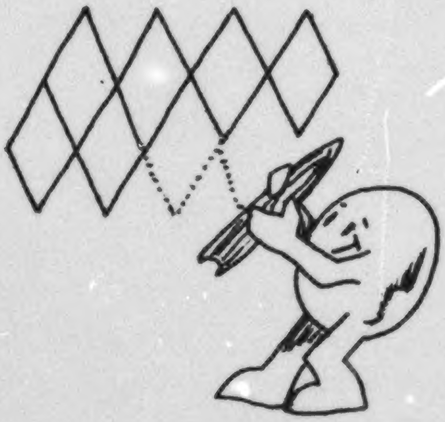
In this day of mechanization, net repairing remains a hand-crafted specialty. When a net has become torn, that place must be repaired if the net is to be useful for catching seafood. The following drawing illustrates how the net should be cut and made ready for the knots to be tied.

When cutting out a hole where the repair needs to be made, care should be given that the knot to which the starting knot is to be tied must have three bars leading to it. All the other knots tied in mending the hole, except the finishing knot, must be tied to a knot with only two bars leading to it. The finishing knot is tied to a knot with three bars leading to it.

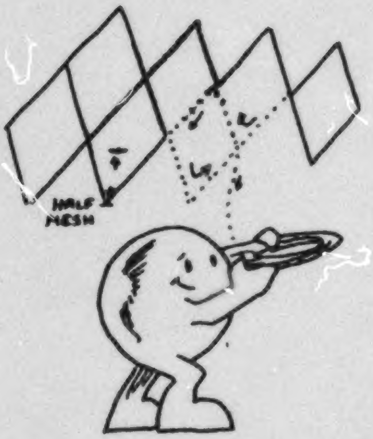


Once the hole has been prepared by cutting it properly so that it can be mended, five simple rules must be followed:

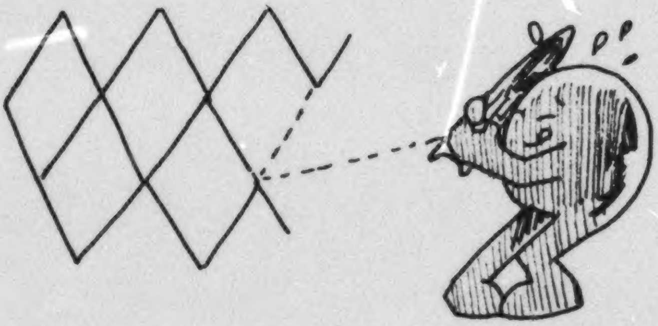
1. Every knot formed must complete a mesh with four equal sides except for the starting and finishing knots.



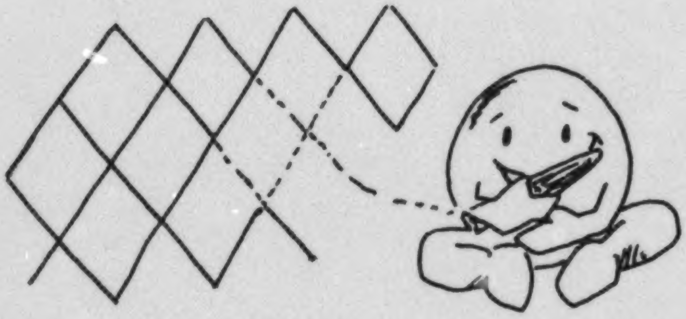
2. Each half mesh row must be completed before the next is started.



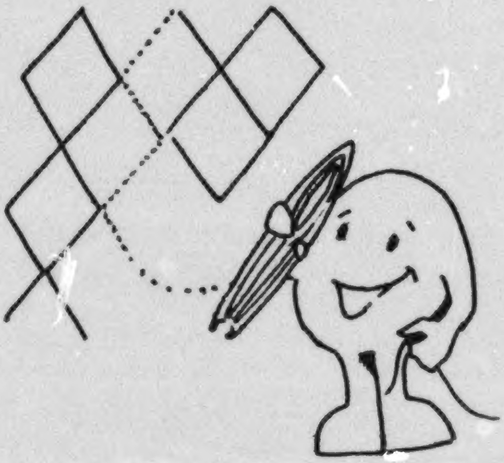
3. Each change of direction across the hole is made by moving to a side knot.



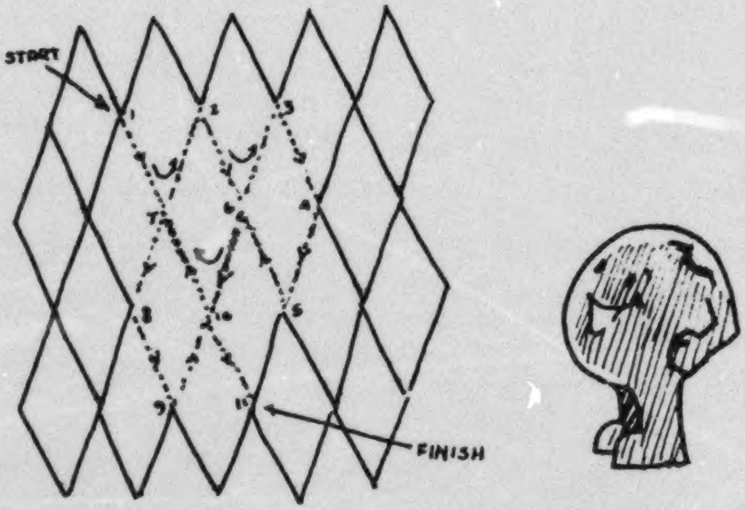
4. After making a side knot, the next knot will be one of the following:
   a. a half mesh knot
   b. a pick up knot followed by a half mesh knot or
   c. a finishing knot.



5. Each successive knot must be on the opposite side of the hole and each involves a change of direction in order for the net to be repaired effectively.



The following drawing illustrates a simple mend in which all the knots are being properly used.



Name ____________________

Occupational Cluster Marine/Fresh Water - Net Repairer

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Identifying knots					
Tying knots					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Aquatic Biologist **DOT CODE:** 041.061-022

DUTIES:

Aquatic biologists study plants and animals living in water and the environmental conditions affecting them. They examine various types of water life, such as plankton, worms, clams, mussels, and snails.

Some aquatic biologists conduct field surveys and investigations to obtain water quality data such as salinity, temperature, acidity, light, oxygen content, and other information to determine their relation to aquatic life. For example, they sample bottom deposits of rivers, lakes, streams, and marine waters to collect data.

WHERE EMPLOYED:

Aquatic biologists are employed by State and Federal water quality and pollution control agencies. They also work in private consulting engineering firms and in research and development.

EMPLOYMENT OUTLOOK:

Employment opportunities for aquatic biologists are expected to be good for those with advanced degrees through the 1980's, but those with lesser degrees may experience competition for available jobs. Some job openings are expected as aquatic biologists retire, die, or transfer to other occupations.

EDUCATION AND TRAINING:

A bachelor's degree with specialization in biology or a physical science is usually adequate for entry into this work. Persons aspiring to become aquatic biologists should strive for a good foundation in a biological science. They should also obtain a basic knowledge in principles of land and water resource research, planning, management, and use; principles of environmental eccology, limnology, and oceanographic investigator methods; statistical methods; the effects of waste materials and natural substances on water quality and biota; and other related subjects.

SPECIAL QUALIFICATIONS:

To be successful in this occupation, a person must be able to write clear, complete, and technically accurate reports and must speak effectively. Other important traits are intellectual curiosity, persistence, thoroughness, and attention to detail. Good eyesight, especially color perception, manual and finger dexterity, and eye-hand coordination are important to perform laboratory tests.

An individual aspiring to work for a particular state may have to study for and pass a civil service examination.

EARNINGS AND ADDITIONAL BENEFITS:

Aquatic biologists receive relatively high salaries; their average earnings are more than twice those of nonsupervisory workers in private industry, except farming.

WORKING CONDITIONS AND LIFESTYLES:

Aquatic biologists spend much of their time inside, usually in laboratories. Working outside may be required when conducting surveys and investigations. They must be familiar with research techniques and complex laboratory equipment. A biologist may work with assistants or a coworker.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Life Sciences

REPRESENTATIVE JOB TITLES:

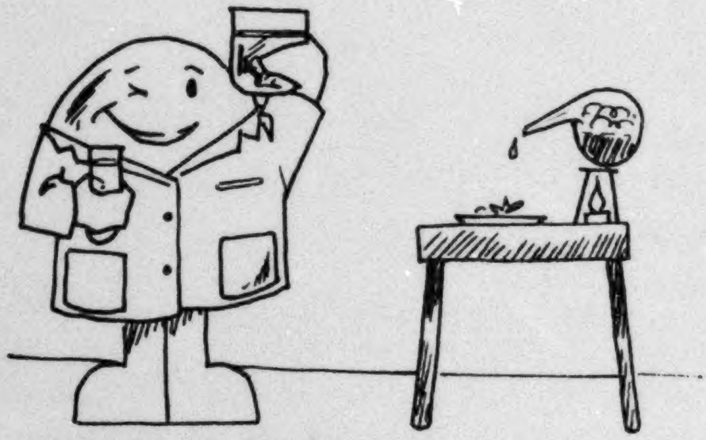
Aquatic Biologist	041.061-022
Limnologist	041.061-022
Aquaculturist	041.061-022

OCCUPATIONAL TASK: Examining water

OCCUPATIONAL COMPETENCY: Finding the amount of oxygen in water

RESOURCES and/or MATERIALS

1. Bottles for collecting water
2. Test tubes
3. Stoppered vials
4. Watch with second hand or timer
5. Methylene Blue indicator solution
6. Copies of Activity Sheet A
7. Student Attitude Sheets



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Determine oxygen rich water.
2. Better understand how aquatic life makes use of the oxygen in the water.
3. Recognize your interests in this type of work.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Complete Activity Sheet A.
3. Write a summary report indicating your findings.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Completing and submitting to the teacher Activity Sheet A.
3. Writing the summary report.
4. Completing the Student Attitude Sheet.

ACTIVITY SHEET A

Aquatic life makes use of the oxygen dissolved in the water. Consequently, dissolved oxygen (DO) content can be used as an index of water quality.

The Methylene Blue Procedure can be used for determining the amount of DO in water. In oxygen poor water, methylene blue fades until the solution is clear, indicating that little or no oxygen is present. On the other hand, methylene blue retains its dark blue color when there is plenty of oxygen in the water.

In the following three simple steps, you can determine whether the water sample is rich or poor in oxygen content.

Step 1. Pour 10 ml of sample water in a test tube.

Step 2. Add 2 ml of Methylene Blue to sample water.

Step 3. Record the amount of time it takes for the color to change from dark blue to another varying color. Indicate the color it has changed to.

Questions:

1. How much time did it take for the color change to take place?

   ____

2. Is your water sample rich or poor in oxygen?

   ____

3. The best way to learn about recent legislation on water usage is to go to public library and read articles and/or visit town hall and make inquiries.

   _____ True   _____ False

4. Choose the best answer. Organizations interested in helping preserve waterways are:

   ___ a. Chamber of Commerce
   ___ b. Conservation Commission
   ___ c. League of Women Voters
   ___ d. Girl Scouts/Boy Scouts
   ___ e. All of the above
   ___ f. None of the above

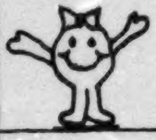
5. Did you enjoy doing this experiment in determining the amount of oxygen in water? ___ Yes   ___ No

Name ______________________________

Occupational Cluster Marine/Fresh Water - Aquatic Biologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Testing for oxygen content in water					
Writing summary report					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Fish Biologist   **DOT CODE:** 041.061-022

DUTIES:

Fish biologists promote the growth and reproduction of fish in nature and in hatcheries. They are concerned with improving and protecting habitats so that fish have a place to live. Fish biologists sample and test water, looking for sources of pollution and for cites where fish can safely live and grow.

Biologists assist in preparing environment impact statements, predicting what effect a power dam, highway, or irrigation project will have on fish populations and suggesting ways to prevent fish loss.

Fish biologists plan and direct hatchery operations and train workers in fish culture; decide what equipment and procedures to use, how many and what kind of fish to raise; arrange for the distribution of fish to lakes and streams; and coordinate the program with that of other Federal and State hatcheries.

WHERE EMPLOYED:

Fish biologists work for State departments of conservation or Federal agencies, particularly the Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and the Forest Service. A few work for aquariums, museums, biological consulting firms, the tropical fish industry, private hatcheries, fishing clubs, and fish or bait farms. Some teach in high schools or colleges or specialize in wildlife journalism or in underwater photography.

EMPLOYMENT OUTLOOK:

Openings for fish biologists are limited and competitive. The number of students studying fish biology is greater than the projected number of openings.

Fish farming (the raising of fish for food) is a growing industry and more openings in this field are expected in the future.

EDUCATION AND TRAINING: The minimum requirement is graduation from a four-year college with a major in biology, zoology, or fisheries management. It is necessary for aspirants to have some knowledge of chemical water analysis, computer science, and statistical methods. The fish biologist may specialize in genetics, embryology, histology, physiology, serology, bacteriology, virology, biometrics, biochemistry, or nutrition. One year of on-the-job training is recommended to provide exposure with hatchery procedures, conservation laws and regulations, agency policies, and methods of administration.

SPECIAL QUALIFICATIONS: Fish biologists should be able to write reports and/or give speeches even on radio and television, if necessary. They are expected to deal effectively with people and be able to supervise.

EARNINGS AND ADDITIONAL BENEFITS: The incomes for fish biologists depend, for the greater part, upon their education, professional experience, and individual abilities.

WORKING CONDITIONS AND LIFESTYLES: More than half of fish biologists' time may be spent in an office or laboratory. Time spent in the field varies with the assignment. They travel, often by boat, walk over rough terrain, and do rigorous outdoor work.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Life Sciences

REPRESENTATIVE JOB TITLES:

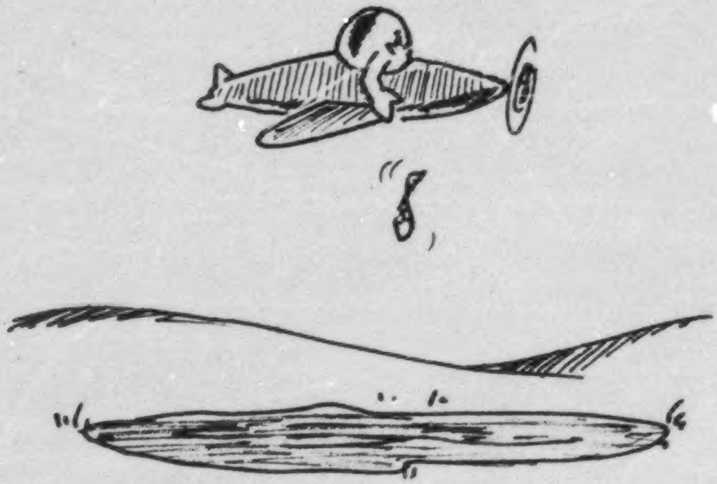
Fish Biologist	041.061-022
Aquatic Biologist	041.061-022
Microbiologist	041.061-058

OCCUPATIONAL TASK: Exploring the duties of a fish biologist

OCCUPATIONAL COMPETENCY: Promoting growth and reproduction of fish

RESOURCES and/or MATERIALS

1. Career Information Sheets
2. Copies of Role Playing Sheets
3. Student Attitude Sheets



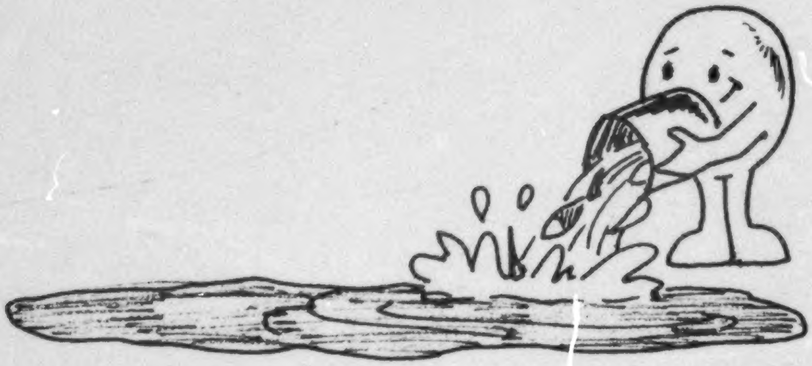
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss duties of fish biologists.
2. Identify clues that may help biologists discover what is killing fish.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Select skit to present to class.
3. Discuss information in skits pertaining to fish biologists.
4. Complete Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participating in skit.
3. Participating in class discussion.
4. Completing Student Attitude Sheet.

Role Playing

Number I

Two boys discussing future careers on their way home from school.

Characters:
Jim, age 15 (very intelligent)
Ted, age 14 (average student)

Jim: I've been reading a book the past few days about fishing. I think I will give my report in English about this book.

Ted: I don't ever look forward to those miserable book reports in English. I'm going to wait until next week before I begin looking for a book.

Jim: Well, this year our teacher told us to select our own books - books that seemed to interest us.

Ted: It's about time that we get to choose our own reading materials. What kind of book did you say you are reading?

Jim: It's about a fish biologist.

Ted: A fish biologist? What kind of work does he do?

Jim: It doesn't necessarily mean that it has to be a him. It can also be a female. The first thing I learned is that the oil in fish is used for vitamins, for skin treatment, and for drugs.

Ted: I didn't know that. I thought fish was used for food only.

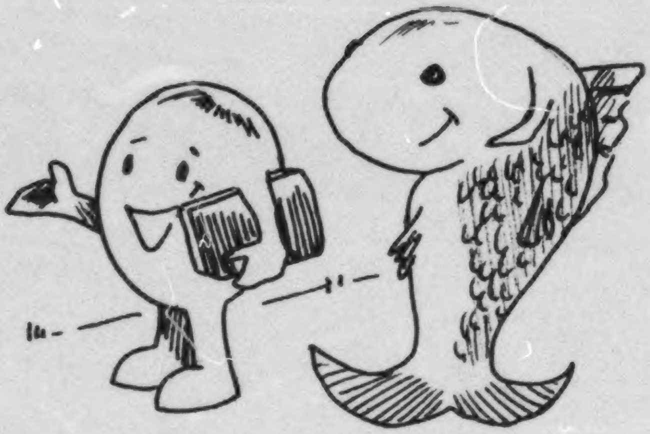
Jim: We also keep fish in aquariums, circuses, zoos, and marinas to the delight of thousands. Some fish are also important for educational study.

Ted: My daddy told me the other day that fish assist humans by feeding on mosquito eggs and other insects.

Jim: Some fish biologists plan and direct hatchery operations. I think I would enjoy being outdoors part of the working time and stocking streams, lakes, and rivers with different kinds of fish. I read that sometimes a fish biologist has to take some fish up in an airplane and then place them in lakes where trucks cannot get to.

Ted: Gosh! That sounds exciting. What did you say that book was called?

Jim: Fish Biologist: The Career For You.



Role Playing

Number II

A young girl is discussing a fish biologist career with her science teacher after school one evening.

Characters:
Mr. Cox - teacher
Sally - student

Sally: I'm discouraged at the TV programs I'm seeing lately with all the abuse in our environment.

Mr. Cox: Yeh! What specifically are you talking about? There is a lot of abuse by non-caring people these days. I guess much of our world is just taken for granted.

Sally: Our fish resources are being jeopardized by overuse and misuse of their natural habitat. Can you believe that overfishing has reduced the number and kind of fish in many areas?

Mr. Cox: Overfishing doesn't bother me as much as the pollution caused by industrial wastes, fertilizers, pesticides, and oil. It's getting really bad---
It does seem that human beings could think of the destruction they are causing rather than just making another dollar.

Sally: What job do you recommend other than teaching if you really want to do something constructive while you are making some money?

Mr. Cox: A fish biologist career should be rewarding. Freshwater biologists attempt to provide more and better habitats for fish.

Sally: How do they manage to do that?

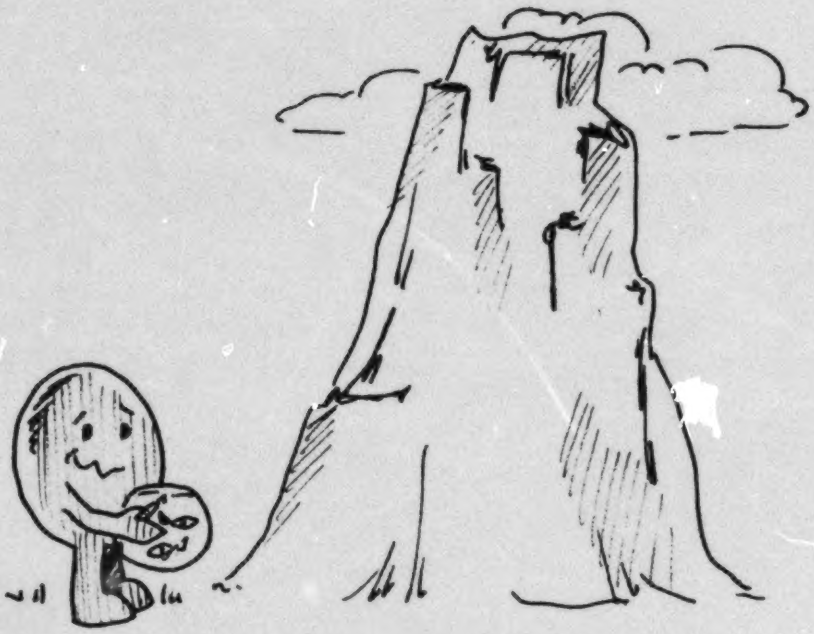
Mr. Cox: Well, sometimes they can open natural spawning areas for some fish species or create artificial nesting sites for others.

Sally: How much education do I need to work as a fish biologist?

Mr. Cox: Oh, you'll need some college training. While you're still in high school, go fishing, camping, and try to maintain an aquarium. In school, take as many science courses as possible. Your classes in English, geography, and physical education will be most helpful.

Sally: Why physical education?

Mr. Cox: Because sometimes you have to go to the lakes and streams and get samples for the laboratory tests and you must be in top physical condition.



Role Playing

Number III

A student goes to interview a fish biologist for a prevocational exploration class report.

Characters:
Student - boy or girl
Fish Biologist

Student: Hello, I'd like to ask you a few questions, if I may, about your work as a fish biologist.

Biologist: Certainly. I like my job very much and I'm delighted to talk with other people about my work.

Student: What do you consider the most important part of your work?

Biologist: Well, it's all important. I suppose an important part of the marine and freshwater biologist's job is research. We need to know much more about our finned creatures so that we can ensure the survival of all aquatic life. I spend much time in the laboratory testing fish for growth rates, age, and any foreign substances that may have caused the death of fish, such as mercury or DDT.

Student: I bet that's very discouraging when you discover that fish have died... Sorta like a medical doctor would feel when people die. What kinds of clues do you look for when fish are found dead unexpectedly?

Biologist: Well,...I look first at the water level, the speed of the river current, the amount of light on the water's surface, the presence of pollutants, and the number of rocks in the riverbed. Always remember that rocks stir up the water and increase its oxygen content.

Student: How many hours do you work a day?

Biologist: My time at work each day varies. I do not work a regular eight-hour day. My work often requires many extra hours on a lake or stream until the job of research or management is completed.

Student: How do you stock the ponds and lakes?

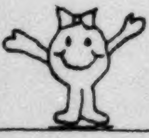
Biologist: Airplanes and special trucks are used to carry fish over long distances from hatchery to the lake where they may be stocked. My work is varied and I count that an asset.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Fish Biologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Participating in class discussion					
Participating in skit					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Fishery Bacteriologist **DOT CODE:** 041.061-058

DUTIES:

A person employed as a fishery bacteriologist specializes in the study of bacteria present in fish and in the environment of fish. This employee may work on the solutions to practical problems in the fishing industry, or may engage in pure research to discover more about aquatic bacteria. S/He may specialize in identifying causes of diseases in fish and effective treatments.

The fishery bacteriologist studies samples of water, mud, plant life, and aquatic animal life to determine the types and amounts of microorganisms present. Concentration may also need to be given to studying the effects of bacteria in fish spoilage. S/He must determine what bacteria are present in fish that have been harvested. This information helps food technologists develop processing methods that safely convert fish to consumer products.

WHERE EMPLOYED:

Persons aspiring to work as fishery bacteriologist may choose to work for the federal government in research and/or quality control programs in the Department of the Interior. Some well-qualified scientists may want to seek employment with large industrial fishing companies. A small number may be in demand to teach in colleges and/or universities. Most of the job opportunities are found in states that have extensive fishing industries.

EMPLOYMENT OUTLOOK:

The fishery bacteriologist position is expected to continue to be in demand throughout the 1980's. As the search for new food supplies continues, the fishing industry is involved and experiencing more rapid development.

EDUCATION AND TRAINING:

The minimum educational requirement for becoming a fishery bacteriologist is a bachelor's degree in bacteriology from an accredited college. Persons who want to become really qualified as bacteriologists should earn their master's degree and a Ph.D. A program of studies should include courses such as physics, chemistry, biology, mathematics, English, foreign language, bacteriology, physiology of bacteria, virology, mycology, ichthyology, fish microbiology, and fisheries management.

SPECIAL QUALIFICATIONS:

A fishery bacteriologist should possess good health, physical stamina, good eyesight, and manual dexterity. S/He should have imagination to form new ideas and also be objective in the evaluation of collected data.

Patience, rapid recall, neatness, a methodical approach, and accurate record keeping are essential.

EARNINGS AND ADDITIONAL BENEFITS:

The earnings for a fishery bacteriologist may depend upon his/her amount of education and experience. However, the salary range is from $11,500 to $15,500 a year. From time to time, civil service employees receive cost of living pay increases.

Additional benefits may include the privilege to join group insurance and retirement plans, receive a vacation with pay, holidays with pay, and be eligible for leave of absence and/or sick leave benefits.

WORKING CONDITIONS AND LIFESTYLES:

The fishery bacteriologist spends most of the eight hours a day, five days a week in a modern laboratory. Sometimes a project takes additional hours after the eight-hour day shift or over a weekend. Flexible schedules allow time off to compensate for some overtime work.

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ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Life Sciences

REPRESENTATIVE JOB TITLES:

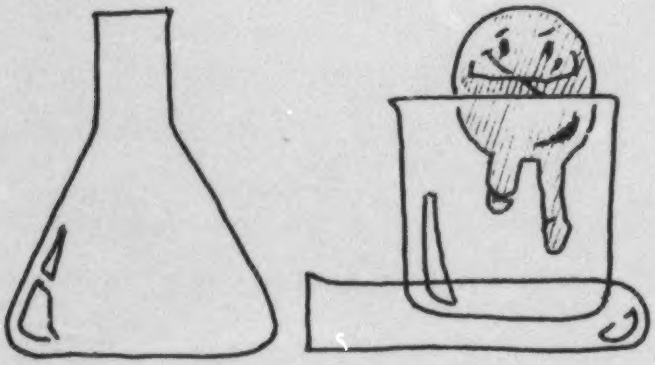
Fishery Bacteriologist	041.061-058
Ichthyologist	041.061-090
Aquatic Biologist	041.061-022

OCCUPATIONAL TASK: Investigating fishery bacteriology

OCCUPATIONAL COMPETENCY: Identifying equipment used in laboratory

RESOURCES and/or MATERIALS

1. Copies of Career Information Sheet
2. Activity Sheet A
3. Student Attitude Sheets



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss advantages and disadvantages of working as a fishery bacteriologist.
2. Appreciate the contributions which these scientists make to fish-food processing industries.
3. Determine if you want to pursue this occupation further.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Complete Activity Sheet A by supplying vowels in the blank spaces.
3. Check your papers for accuracy.
4. Pronounce the names of the pieces of equipment.
5. Alphabetize the 10 pieces of equipment.
6. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Completing Activity Sheet A.
3. Participating in pronouncing of the names of the equipment.
4. Alphabetizing the equipment.
5. Completing and submitting the Student Attitude Sheet to the teacher.

Activity Sheet A

Many pieces of equipment are found in a laboratory where the fishery bacteriologist is working five days a week. This activity involves your placing a vowel in the following words and spelling them correctly. Lastly, alphabetize the 10 names of equipment.

1. M_cr_sc_p_s — 1. ____________________

2. P_tr_ d_sh_s — 2. _________ _________

3. B__k_rs — 3. ____________________

4. T_st t_b_s — 4. _________ _________

5. Fl_sks — 5. ____________________

6. P_p_tt_s — 6. ____________________

7. B_r_tt_s — 7. ____________________

8. Sp_ctr_ph_t_m_t_rs — 8. ____________________

9. Chr_m_t_gr_ph_c _q__pm_nt — 9. ____________________ ____________________

10. Sp_c__l_z_d gl_ssw_r_ — 10. ____________________ ____________________

Activity Sheet A - Key

(vowels supplied)

1. Microscopes
2. Petri dishes
3. Beakers
4. Test tubes
5. Flasks
6. Pipettes
7. Burettes
8. Spectrophotometers
9. Chromatographic equipment
10. Specialized glassware

Activity Sheet A - Key

(alphabetized list)

1. Beakers
2. Burettes
3. Chromatographic equipment
4. Flasks
5. Microscopes
6. Petri dishes
7. Pipettes
8. Specialized glassware
9. Spectrophotometers
10. Test tubes

Name ____________________

Occupational Cluster Marine/Fresh Water - Fishery Bacteriologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Learning about equipment in laboratory of fishery bacteriologist					
Alphabetizing 10 items of equipment					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Invertebrate Zoologist **DOT CODE:** 041.061-090

DUTIES:

An invertebrate zoologist studies sponges, jellyfish, and protozoa in their natural habitat and collects specimens for laboratory study. S/He dissects and examines specimens under a microscope and uses chemicals and various types of scientific equipment to carry out experimental studies.

This employee may prepare collections of preserved specimens or microscopic slides for such purposes as identification of species, study of species development, and study of diseases associated with jellyfish and/or protozoa. S/He may raise specimens for experimental purposes.

WHERE EMPLOYED:

Colleges and universities employ zoologists in both teaching and research jobs.

The Federal Government employs life scientists in the Department of Agriculture, Department of the Interior, and National Institutes of Health. State and local governments also employ well-qualified life scientists of which zoologists are a part.

Private industries are other places to seek employment. Nonprofit research organizations and foundations and/or self-employed are also avenues for consideration for aspiring zoologists.

EMPLOYMENT OUTLOOK:

The employment outlook is expected to be good for invertebrate zoologists through the 1980's. Job openings are expected to occur as zoologists retire, die, or transfer to other occupations.

Employment opportunities in industry and government should grow as environmental research and development increase and new laws and standards protecting the environment are enacted.

Additional zoology teachers may be needed if college and university enrollments increase as expected.

EDUCATION AND TRAINING:

Persons seeking a career as an invertebrate zoologist should obtain the broadest possible undergraduate background in biology and other sciences. Courses taken should include biology, chemistry, physics, and mathematics.

Many colleges and universities confer advanced degrees. Requirements for advanced degrees usually include fieldwork and laboratory research as well as classroom studies and preparation of a thesis.

SPECIAL QUALIFICATIONS:

Prospective zoologists should be able to work independently or as part of a team and should be able to communicate their findings in clear and concise language, both orally and in writing.

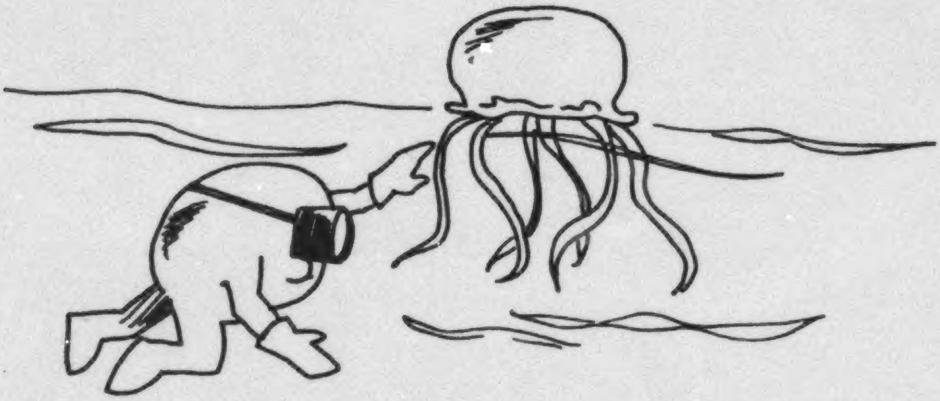
These workers, when conducting research in deep waters or remote areas, must have stamina.

EARNINGS AND ADDITIONAL BENEFITS:

The earnings of an invertebrate zoologist will depend upon the place of employment and years of experience. Expected salaries may range from $12,500 to $23,800 a year.

Salaries paid to college and university zoology teachers are comparable to those paid to other faculty members.

WORKING CONDITIONS AND LIFESYTLES:	These employees generally work regular hours in offices, laboratories, or classrooms and usually are not exposed to unsafe or unhealthy conditions. When working in laboratories, zoologists must be familiar with research techniques and laboratory equipment such as electron microscopes. Knowledge of computers also is useful in conducting experiments.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Life Sciences

REPRESENTATIVE JOB TITLES:

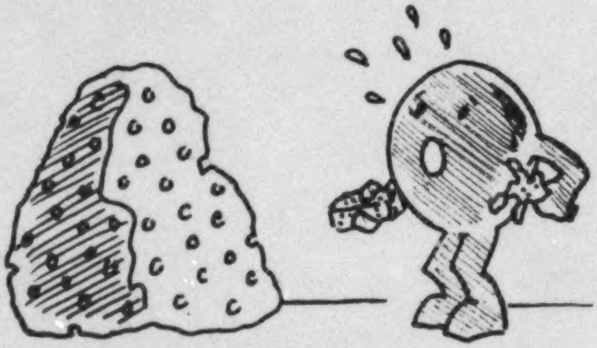
Invertebrate Zoologist	041.061-090
Microbiologist	041.061-058
Aquatic Biologist	041.061-022

OCCUPATIONAL TASK: Investigating the work of an invertebrate zoologist

OCCUPATIONAL COMPETENCY: Identifying sponges

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet: "An Unusual Giant"
3. Activity Sheet A - Identification of Sponges
4. Student Attitude Sheet



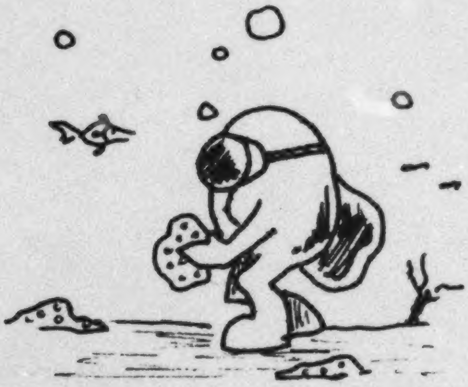
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand the work performed by an invertebrate zoologist.
2. Become more knowledgeable of a variety of sponges.
3. Be more appreciative of people employed in life sciences occupations.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Read the Information Sheet - "An Unusual Giant."
3. Complete Activity Sheet A - Identification of Sponges.
4. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Reading the Information Sheet - "An Unusual Giant."
3. Completing Activity Sheet A - Identification of Sponges.
4. Completing the Student Attitude Sheet.

Information Sheet

"An Unusual Giant"

Sponges are simple, multi-celled animals equipped to filter vast quantities of water. They have no head, no appendages for gesticulating, no organs or nerves, and no particular shapes. Several hundred gallons per day of salt sea water may pass through each sponge's canals whose openings are seen as the holes.

Sponges are found in all seas at all depths. They are made of astronomical numbers of amebas and hair-wavers (flagellates) stuck together to compose an extraordinary sort of skin that forms the tubes of the sponge body. Sponges have a base or a stem by which they attach themselves to a rock or some other object on the sea bottom.

These animals have tough elastic skeletons and the bodies of living sponges have jelly between in which amebas travel far to do odd jobs in building the animals and adding their own bodies as building materials. As living jelly sandwiches they have freedom of movement to grow to any size. Any tiny fragment of a live sponge can create a full-size sponge.

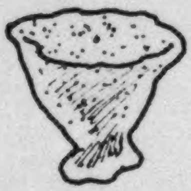
The usual sponge method of reproduction is called "budding." A cell may swell like a bubble, break away, and start a new sponge when and if the fragment hits a firm spot. Once the larva sponge becomes established, it begins to develop into the adult sponge. Sponges are able to replace lost body parts or most of the body if it should become destroyed.

Living sponges are varied in color. They may be highly colored--yellow, red, purple, blue, and green--or black, brown, or gray. They may be difficult to identify because they vary in shape, size, and color according to the substrate they fasten to and other local conditions. They are most numerous and there are more kinds of sponges in the tropical to warm temperate waters than elsewhere. These waters also house the largest sponges. Sponges may range in sizes from two inches to five feet tall.

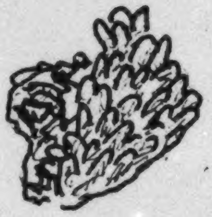
Activity Sheet A

Identification of Sponges

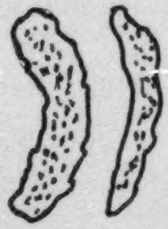
Invertebrate zoologists study sponges and are required to know different kinds by shape, size, and color. Try to match the name of sponge to the shape in the following examples.



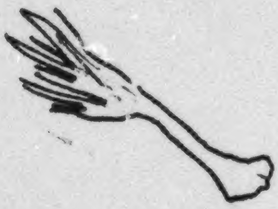
1. ____________________



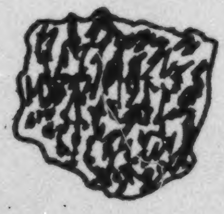
2. ____________________



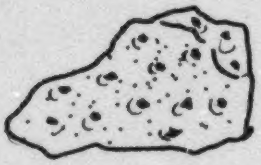
3. ____________________



4. ____________________



5. ____________________



6. ____________________

(a) Elephant-Ear (b) Sheep's Wool (c) Venus's-Flower-basket

(d) Grassrope Sponge (e) Velvet Sponge (f) Grass Sponge

Name ______________________________

Occupational Cluster Marine/Fresh Water - Invertebrate Zoologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading the Career Information Sheet on Invertebrate Zoologist					
Reading "An Unusual Giant"					
Identifying sponges					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Microbiologist DOT CODE: 041.061-058

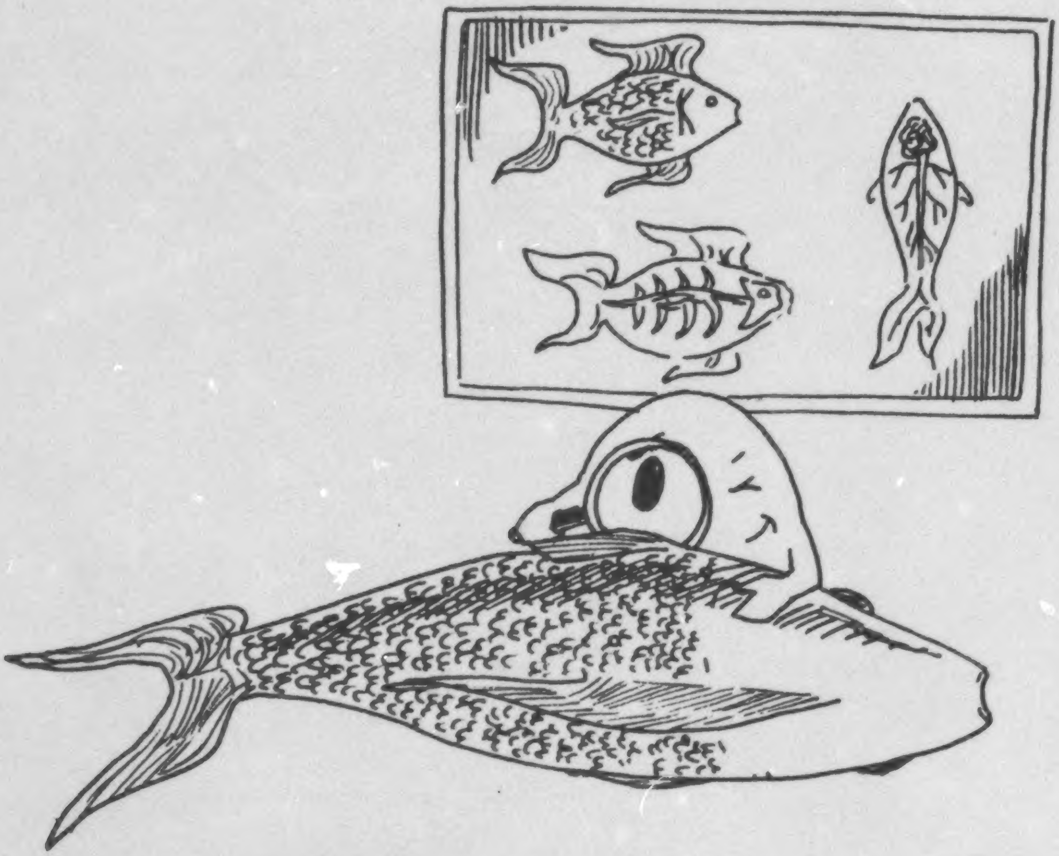
DUTIES:	Persons employed as microbiologists carry out tests and do research on the causes, control, and cure of diseases originating with destructive microorganisms and on the culture and use of beneficial microorganisms. Marine microbiologists study the microorganisms of the sea, the diseases of fish and shellfish, and the vital ecological balances in the oceans.
WHERE EMPLOYED:	Microbiologists are employed by colleges and universities as teachers and/or researchers. Federal, state, and local governments also employ microbiologists to work in various capacities.
EMPLOYMENT OUTLOOK:	The employment outlook for microbiologists is expected to continue to be good through the 1980's. In addition to openings occurring from growth of the occupation, vacancies for microbiologists will result from the need to replace present workers who retire or leave the profession for other reasons.
EDUCATION AND TRAINING:	Aspirants to a career in microbiology should take a college entrance program during high school, including all possible courses in biology, chemistry, physics, and mathematics, as well as English and a foreign language. Completion of a bachelor's degree in microbiology or a closely related biological science is the minimum education necessary to qualify for entry-level positions in this occupational area. Employment in most research, teaching, and

administrative positions generally requires advanced study leading to the master's or doctor's degree.

SPECIAL QUALIFICATIONS: Aspirants should be alert, dependable, persevering, and able to get along well with others. Other important traits include patience, and the ability to concentrate, to make accurate and detailed observations, and to clearly express ideas both orally and in writing. Persons considering this career should have above average scholastic ability (especially in science and mathemathics), scientific curiosity, and a keen interest in the study of living organisms. Good eyesight and color discrimination as well as finger dexterity are also necessary.

EARNINGS AND ADDITIONAL BENEFITS: Salaries in microbiology are related to the educational background, experience, and responsibilities of the individual, and the size, location, and type of organization for which they work. Fringe benefits usually include vacations and holidays with pay, insurance coverage, and some type of retirement plan.

WORKING CONDITIONS AND LIFESTYLES: Most microbiologists work a regular five-day, 40-hour week, but overtime may be necessary at times, especially in research and administrative positions. In general, working conditions are favorable. Teachers in colleges and universities work in classrooms and laboratories which are normally comfortable and adequately equipped. Some employed in microbiology may work in a variety of locations outside the laboratory while gathering data and research samples. The hazards of working with infectious tissues and potentially dangerous microorganisms demand strict compliance with safety regulations and precautions. In some instances, microbiologists may be required to wear protective clothing while performing their duties.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Life Sciences

REPRESENTATIVE JOB TITLES:

Microbiologist	041.061-058
Water-Treatment Plant Operator	551.485-010
Supervisory Waste water-Treatment Plant Operator	955.130-010

OCCUPATIONAL TASK: Understanding water purification

OCCUPATIONAL COMPETENCY: Constructing a water purifier

RESOURCES and/or MATERIALS

1. Cans
2. Funnels
3. Sand
4. Ringstands
5. Charcoal
6. Gravel
7. Chlorine tablets
8. Microscopes
9. Water samples
10. Worksheet A
11. *Dictionary of Occupational Titles*
12. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize the purpose and importance of water purification.
2. Recognize and explain a method of purifying water.

LEARNING ACTIVITIES

1. Read "Microbiologist" and "Water-Treatment Plant Operator" in the Dictionary of Occupational Titles.
2. Read Worksheet A, "Constructing A Water Purifier".
3. Research this area using the facilities in the library.
4. Compare before and after filtering water samples as viewed under microscope.
5. Construct and demonstrate to the class a water purifier.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Constructing and demonstrating your water purification system.
2. Comparing your purified water with a sample of water before purification. This will be done by:
    a. Comparing color and odor.
    b. Observing each under the microscope.
3. Completing Student Attitude Sheet.

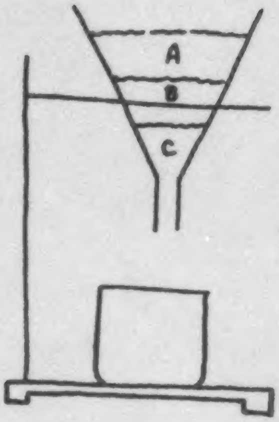
WORKSHEET A

Constructing A Water Purifier

Very few people in today's world have sources of pure, clean, untreated water for home or industrial use. People in most places spend a good deal of time, money, and energy in construction and maintenance of water-treatment plants. After water has been used, it must be purified (cleaned) so that other organisms (including other humans) can use it. When water is returned to the natural environment, it should be usable by any organism without causing that organism harm.

Your teacher will give you a sample of dirty water. Construct the pictured device that will purify the water. You may want to do some research in the library to get some additional ideas before you begin. Do not taste the water!

WATER PURIFIER MODEL



A. Gravel

B. Sand

C. Charcoal

Name ____________________

Occupational Cluster Marine/Fresh Water - Microbiologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it
Using a microscope					
Constructing a water purification model					
Library research					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Aquarium Tank Attendant DOT CODE: 449.674-010

DUTIES:

An aquarium tank attendant attends fish and other aquatic life in aquarium exhibits. S/He prepares food and feeds fish according to schedule. Periodically, this worker cleans the tanks, removes algae from the tank windows, and attends to aquatic plants and decorations in displays.

Daily, s/he monitors thermometers to ascertain water temperature, adjusts thermostats, and adds chemicals to water to maintain specified water conditions. The attendant observes the fish to detect disease and injuries, reports condition to supervisor, and treats fish according to instructions.

Occasionally, the aquarium tank attendant may fire sedation gun and assist the crew expedition members in the collection of aquatic life.

WHERE EMPLOYED:

Persons aspiring to work as aquarium tank attendants should make applications in places such as schools of oceanography, pet stores, zoos, amusement areas, museums, and/or independently controlled restaurants.

EMPLOYMENT OUTLOOK:

The aquarium tank attendant position is expected to continue to be in demand throughout the 1980's. As amusement areas and pet shops become more plentiful, additional tank attendants will be needed to fill the demand.

EDUCATION AND TRAINING:

The minimum educational requirement for becoming a tank attendant is a high school education. Some places of employment may require the applicant to have a degree in marine biology. Limited experiences may be obtained at local pet shops, zoos, parks, and amusement areas.

SPECIAL QUALIFICATIONS:

A scuba diving certificate may be necessary for persons assigned to go on collecting trips for various species of marine life.

Experience in arranging aquariums should prove to be an asset to persons interested in becoming tank attendants.

EARNINGS AND ADDITIONAL BENEFITS:

The earnings for an aquarium tank attendant may depend upon his/her amount of education, experience, and/or place of employment.

Additional benefits may include the privilege to join group insurance and retirement plans, receive a vacation with pay, holidays off with pay, and be eligible for leave of absence and/or sick leave benefits for persons employed as full-time.

WORKING CONDITIONS AND LIFESTYLES:

Most of the time, these persons are working indoors in a comfortable environment.

Occasionally, some of them may have to help capture various species of marine/fresh water life to place in an aquarium. This may necessitate their going to rivers, lakes, and/or oceans to complete the tasks of obtaining the species.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

Aquarium Tank Attendant	449.674-010
Oyster Floater	449.687-010
Fish Farmer	446.161-010

OCCUPATIONAL TASK: Focusing on aquatic life

OCCUPATIONAL COMPETENCY: Designing an arrangement of aquatic plants and decorations for display

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Inventory A - DID YOU KNOW THAT---?
3. Information Sheet A - LEADING AQUARIUMS IN THE UNITED STATES
4. Activity Sheet A
5. Student Attitude Sheet

Optional

Lionni, Leo. Fish As Fish. Pinwheel Books, 1974.
Sea World of Ohio, Education Department, 1100 Sea World Drive, Aurora, Ohio 44202.

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss the tasks of an aquarium tank attendant.
2. Become more knowledgeable of aquariums in the United States.
3. Evaluate yourself as an aquarium tank attendant.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Complete Inventory A - DID YOU KNOW THAT...
3. Read and discuss Information Sheet A - LEADING AQUARIUMS IN THE UNITED STATES.
4. Design an arrangement of aquatic plants and decorations for display in a local pet shop. Students may choose to make an aquarium or draw a picture on an 8½ x 11 inch sheet of paper. (Substitute projects may be selected from Activity Sheet A.)
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Completing Inventory A.
3. Reading and discussing Information Sheet A.
4. Designing an arrangement of aquatic plants and decorations for display in local pet shop.
5. Complete the Student Attitude Sheet.

Inventory A

DID YOU KNOW THAT...

YES	NO		
		1.	An aquarium is a bowl or tank in which water animals and plants are kept?
		2.	A public aquarium is a building in which many tanks of fish are kept to educate and entertain the public?
		3.	The term aquarium was first used by the Romans?
		4.	A balanced aquarium is one in which animals and plants live together easily by helping each other?
		5.	The animals give off the gas carbon dioxide?
		6.	The plants use this gas and in turn give off oxygen, which the animals breathe?
		7.	A home aquarium should be placed in strong light, but not in direct sunlight?
		8.	Water plants which furnish the most oxygen are vallisneria, sagittaria, and anacharis?
		9.	Sea shells and coral should not be used in a fresh-water aquarium, because they are harmful?
		10.	One gallon of water for each inch of the fish's body is right?
		11.	Too great a number of fish will use more oxygen than the plants can produce?
		12.	Most fish like small bits of raw beef, fish, or shrimp?
		13.	Goldfish like chopped worms and flies?
		14.	Fish may be fed as often as they will eat; however, they should never be given more than they will eat in ten minutes?
		15.	Tropical fish must be kept in water that has a temperature of at least 70°F?

Information Sheet A

LEADING AQUARIUMS IN THE UNITED STATES

NAME	LOCATION	KIND
U.S. Fish and Wild Life Aquarium	Washington, D. C.	Freshwater
New York Aquarium	New York	Marine and Freshwater
Fairmont Park Aquarium	Philadelphia, Pennsylvania	Marine and Freshwater
Steinhart Aquarium	San Francisco, California	Marine and Freshwater
John G. Shedd Aquarium	Chicago, Illinois	Marine and Freshwater
Marine Aquarium	St. Augustine, Florida	Marine

The largest and best-equipped public aquarium in the United States is the John G. Shedd Aquarium in Chicago.

Activity Sheet A

From the following list, select at least one activity for a project to be completed by you.

1. Plan and execute a puppet show pertaining to the sea and its environment.

2. Prepare a five-minute oral report pertaining to positive training techniques for aquatic animals at parks, such as Sea World.

3. Write a letter requesting free information to be shared by the class pertaining to aquatic animals and related topics. One place that may be able to assist you with up-to-date information is Sea World of Ohio, Education Department, 1100 Sea World Drive, Aurora, Ohio 44202. Students who have travelled to California and/or Florida may have addresses of places to write for free information or they may have collected information that they can share with the class.

4. Collect pictures to be used in a collage. Examples of pictures may consist of:

   (a) California sea lion

   (b) Green sea turtle

   (c) Common dolphin

   (d) Cod

   (e) Killer whale

   (f) Albacore

   (g) Yellowfin tuna

   (h) Lanterfish

   (i) Brittle star

   (j) Giant squid

   (k) Hatchetfish

   (l) Shrimp

   (m) Deepsea anemone

   (n) Great white shark

   (o) Octopus

   (p) Flying fish

   (q) Plankton

   (r) Pilotfish

   (s) Halibut

   (t) Atolla jellyfish

Name ______________________________

Occupational Cluster Marine/Fresh Water - Aquarium Tank Attendant

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it
Reading the Career Information Sheet					
Completing the inventory - DID YOU KNOW THAT...?					
Reading and discussing LEADING AQUARIUMS IN THE UNITED STATES					
Designing an aquarium to be placed in a local pet shop					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Clam Sorter DOT CODE: 446.687-010

DUTIES:

A clam sorter removes marketable clams from a conveyor belt or from a pile on deck of the clam-harvesting dredge and deposits them in containers. S/He dumps clams from containers onto worktable or dock, sorts, and packs them in containers for shipping according to species.

Occasionally, this employee is asked to assist the shellfish dredge operator in the adjustment, repair, and maintenance of dredge and conveyor equipment by using various handtools.

WHERE EMPLOYED:

Clam sorters are employed by industries that are in the clam processing business.

EMPLOYMENT OUTLOOK:

Little or no change is expected in employment of clam sorters through the 1980's. Most job opportunities will arise because of the need to replace experienced workers who retire, die, or transfer to other occupations.

More clam sorters may be needed as population, personal income, and restaurants grow. However, the demand for clam sorters may be limited because their employment depends upon the supply of crabs and the demand for the preserved clam meat.

EDUCATION AND TRAINING:

Clam sorters' skills usually are mastered through informal on-the-job training.

SPECIAL QUALIFICATIONS:

The nature of clam sorting requires finger and hand dexterity, good eye-hand coordination, patience, and concentration.

EARNINGS AND ADDITIONAL BENEFITS:

Earnings of clam sorters vary according to the agreement between employer-employee. Sometimes the clam sorter's income is the money obtained through a certain share of the catch. The vessel owner may keep a certain percentage of the total earnings and divide the remaining amount equally among the crew members.

Factors such as the amount of a catch, the weather, and the demand for clams make the income from clam sorting unpredictable even from day to day.

The kinds and amounts of fringe benefits depend upon the individual company for which the employed clam sorter is working.

WORKING CONDITIONS AND LIFESTYLES:

The clam-harvesting dredge may be small and allow seating for only a few people.

A clam sorter may work in a boat over one body of water or move from place to place. This employee works during daylight hours, usually setting out in the boat at sunrise and returning to shore at dusk.

Private grounds are used for farming clams. Hydraulic dredges are used for harvesting clams and mechanical methods are implemented for removing unwanted predatory animals.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

Clam Sorter	446.687-010
Soft Crab Shedder	446.684-018
Laborer, Aquatic Life	446.687-014

OCCUPATIONAL TASK: Exploring marine life cultivation

OCCUPATIONAL COMPETENCY: Focusing on working as a clam sorter

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet - VOCABULARY PERTAINING TO CLAMS
3. ACTIVITY SHEET A - MY NAME IS CLAM
4. Student Attitude Sheet

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Appreciate the contributions made by clam sorters to the food industry.
2. Become more knowledgeable of different types of clams.
3. Realize more possibilities for future clam farming.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet material.
2. Review the Information Sheet - VOCABULARY PERTAINING TO CLAMS.
4. Complete ACTIVITY SHEET A - MY NAME IS CLAM.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet material.
2. Participation in class discussion and/or bringing samples and/or pictures of clams to class.
3. Completing ACTIVITY SHEET A - MY NAME IS CLAM.
4. Completing and submitting the Student Attitude Sheet to the teacher.

Information Sheet

VOCABULARY PERTAINING TO CLAMS

1. Foot - Large organ used to burrow and move from place to place

2. Valves - Hard shell made up of two parts

3. Ligament - Fastens valves together

4. Mantle - Fleshy part of the body just inside the shell which secretes

5. Mantle Cavity - Space between the main body of the clam and the mantle with its shell

6. Ventral Siphons - Openings at the back end which allow water filled with food and oxygen to pass into the mantle cavity

7. Sinuses - Other spaces in clam's body where blood circulates

8. Quahog - Indian name for hard-shelled clam

9. Mya Arenaria - Classification given to soft-shell clam

10. Venus Mercenaria - Classification given to hard-shell clam

11. Tridacna Gigas - Classification given to the giant clam

ACTIVITY SHEET A - MY NAME IS CLAM

Read carefully and fill in blank spaces with clam(s).

1. ____________ are very valuable as food.

2. ____________ live in the (muddy) or (sandy) bottom of lakes or streams.

3. The ____________ is covered by a (hard) shell consisting of two parts.

4. The ____________ has gills which hang into the mantle cavity on each side of the foot.

5. In the ____________, oxygen passes from the water in the mantle cavity into the gills.

6. The ____________ feeds on (tiny) (sea) animals and plants.

7. The ____________ has a heart and blood vessels.

8. (Soft-shell) ____________ send out spurts of water and pull in their siphons when disturbed.

9. Quahog is the name sometimes given to the (hard-shell) ____________

10. (Soft-shell) ____________ have (smooth), (thin) shells and may be found living on tidal flats from South Carolina to Greenland, in the San Francisco Bay, and on the British Coast.

11. (Soft-shell) ___________ are sometimes used as bait.

12. A (giant) ___________ may be found on the coral reefs on the East Indies and Australia.

13. The (living) (giant) ___________ often weighs more than 500 pounds when it is taken from the coral reefs of the Indian and Pacific Oceans.

14. The United States alone produces over 17,000 tons of meats of the surf ___________, Spistula.

17,000 TONS
of clam

Name ______________________________

Occupational Cluster Marine/Fresh Water - Clam Sorter

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with Career Information Sheet pertaining to clam sorter					
Reviewing VOCABULARY PERTAINING TO CLAMS					
Completing ACTIVITY SHEET A - MY NAME IS CLAM					
Sharing samples/pictures of clams with the class					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Crab Butcher **DOT CODE:** 525.684-022

DUTIES:

A crab butcher is responsible for preparing crabs for canning. Crabs are caught in wire trap baskets and brought to the processing plant. First they are cooked for approximately twenty minutes in boiling water. A crab butcher twists, pulls, and detaches crab body from back of crab and places various body parts in beds of ice. A knife is used to remove crab meat which is placed in can container to be transported to purchasers.

WHERE EMPLOYED:

Crab butchers are employed by industries that are in the crab processing business.

EMPLOYMENT OUTLOOK:

Little or no change is expected in employment of crab butchers through the 1980's. Most job openings will arise because of the need to replace experienced workers who retire, die, or transfer to other occupations.

More crab butchers will be needed as population, personal income, and restaurants grow. However, the demand for crab butchers may be limited because their employment depends upon the supply of crabs and the demand for the preserved crab meat.

EDUCATION AND TRAINING:

Crab butchers' skills usually are learned through informal on-the-job training.

SPECIAL QUALIFICATIONS:

The nature of crab butchering requires finger and hand dexterity, good eye-hand coordination, patience, and concentration.

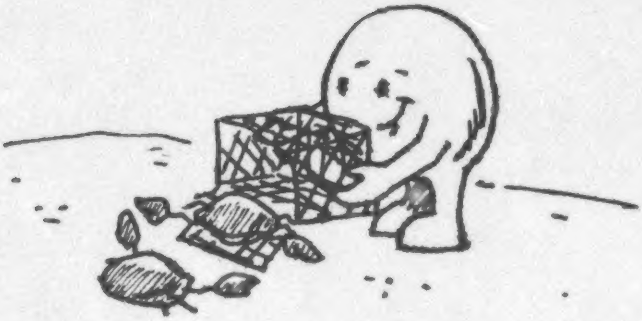
EARNINGS AND ADDITIONAL BENEFITS:

Earnings of crab butchers vary widely and depend on level of skill, geographic location, season of the year, and employer. Frequently, employees are paid on a piecework basis according to the number of completely filled pint-sized cans.

WORKING CONDITIONS AND LIFESTYLES:

Crab butchering plants generally are well lighted and well ventilated, but have damp floors and tables resulting from ice beds packed around crab body pieces.

The work is seasonal lasting from April through December. During this time, employees usually work five days a week, averaging 30-40 hours per week depending upon the supply of crabs to be processed.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

Crab Butcher	525.684-022
Soft Crab Shedder	446.684-018
Oyster Floater	449.687-010

OCCUPATIONAL TASK: Marketing crabs

OCCUPATIONAL COMPETENCY: Designing a trap for catching crabs

RESOURCES and/or MATERIALS

1. Career Information Sheets
2. 8½ x 11 sheets of paper
3. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand how crabs are prepared for consumers.
2. Realize the process for capturing crabs.
3. Appreciate workers in this field of work.

LEARNING ACTIVITIES

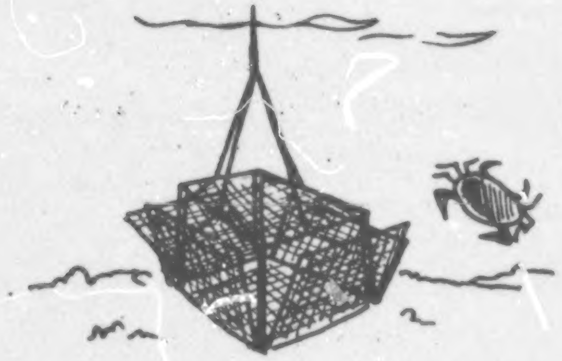
1. Read Career Information Sheet.
2. Draw a picture of a trap which could be used for catching crabs. Explain in writing (25 words or less) how the trap can be used effectively.
3. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

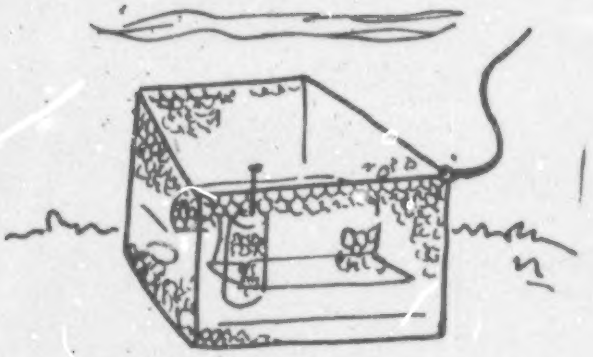
Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Completing drawing of crab trap.
3. Completing and submitting to teacher the Student Attitude Sheet.

EXAMPLES OF CRAB-CATCHING EQUIPMENT



Collapsible Hand Trap



Commercial Crab Pot

Name ______________________________

Occupational Cluster Marine/Fresh Water - Crab Butcher

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Drawing a trap for catching crabs					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Crab Farmer's Helper (Soft Crab Shedder)

DOT CODE: 446.684-018

DUTIES:

These workers raise soft-shell crabs for food markets by catching crabs from the ocean and retaining them in tanks until they molt. They sort the crabs according to stages of the shell development and dump them into open tanks containing sea water. The helpers start the pumps to aerate water and maintain constant flow of sea water through tanks. They observe the crabs to ascertain when they begin to shed their brittle outer shell. Sometimes, the helpers hold the shell being shed to assist emerging crabs that get hung in shells during molting. Later, they gather the freshly emerged soft-shell crabs and place them in containers for shipments to markets.

Often the crab farmer's helper is responsible for gathering the garbage and placing it on a truck so it can be hauled away. These workers may also clean the tanks, taking out any pieces of shell and adding water if necessary. As fishermen bring more crabs to the farm, s/he sorts the crabs and puts them into the proper tank. Occasionally, a crab helper may also help clean fishing equipment, repair torn nets, and/or fix broken crab traps. Lastly, crab farmer helpers may go out on boats and help catch crabs from time to time. In most places, their work is limited to the farm.

WHERE EMPLOYED:

Persons aspiring to work as crab farmer helpers should visit a farm and talk to the owner about a job. There are many crab farms along the Atlantic and Pacific coasts of the United States as well as in Alaska.

EMPLOYMENT OUTLOOK: Employment is expected to grow about as fast as the average for all occupations through the 1980's. People will probably continue to want to eat soft-shell crabs. Because much of our seafood is imported from other countries, the number of job openings for crab farmers' helpers may be more limited.

EDUCATION AND TRAINING: A high school education is preferred. Courses in high school which may help employees to work well with their hands are recommended. Shop or art classes are good training. Classes in social studies may provide insight to the fishing industry and various seafoods. English classes sometimes are assets in developing skills in understanding instructions and following them carefully.

The training for a crab farmer's helper is received on the job. The employer usually works with the employee until s/he can work well alone.

SPECIAL QUALIFICATIONS: Persons aspiring to work as crab farmers' helpers should be able to use their hands easily. Crabs are wet and slippery and must be handled very carefully daily. Good eyesight is necessary while determining the proper tank for each crab. These helpers should be strong and healthy so they can work productively in a damp, cool place without catching cold.

Following instructions is important in this work. The helper has to work alone much of the time and do many kinds of work each day.

EARNINGS AND ADDITIONAL BENEFITS: Helpers on a crab farm usually are paid a minimum wage for each hour they work. Sometimes the employer may pay the employees extra money when an unexpected amount of crabs is caught and processed. Earnings and fringe benefits may vary depending upon the employer and his/her profit earned each year.

WORKING CONDITIONS AND LIFESTYLES:

These workers usually work eight hours a day for five or six days a week. The work is usually all year round.

Crab farmer helpers are on their feet most of the working day. The helpers are expected to do a variety of jobs, move around a lot, and many times help to move heavy tanks and/or barrels. Because of an excess of water, the worker usually wears a rubber apron, boots, and gloves. The gloves are necessary for protection from the cold water and the sharp claws of the crabs.

The rooms where workers perform these tasks are usually damp and cool; consequently, there are more chances of catching colds. The helpers have to bend a lot to reach crabs in the tanks. Precautions have to be taken always so they do not slip on the wet and slippery floors.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

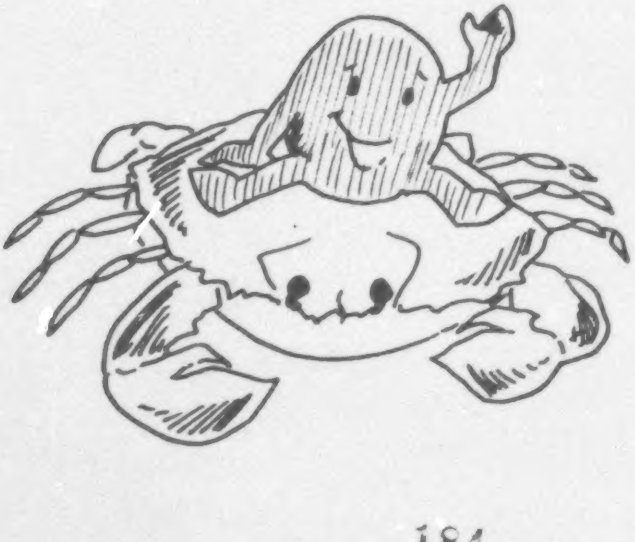
Crab Farmer's Helper	446.684-018
Clam Sorter	446.687-010
Oyster Floater	449.687-010

OCCUPATIONAL TASK: Examining the crab industry

OCCUPATIONAL COMPETENCY: Identifying crabs

RESOURCES and/or MATERIALS

1. Career Information Sheets
2. Self-Inventory: Is This the Job for You?
3. Information Sheet: Kinds of Crabs
4. Blue Crab Fact Sheet
5. Activity I: Crab Identification
6. Student Attitude Sheets



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand the duties of a crab farmer's helper.
2. Become more knowledgeable of equipment used in catching crabs.
3. Appreciate crabs as being an important part of marine science.
4. Determine if you may desire to learn more about crab industries.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Complete Self-Inventory: Is This the Job for You?
3. Read and discuss Information Sheet: Kinds of Crabs.
4. Read Blue Crab Fact Sheet.
5. Complete Activity I - Crab Identification.
6. Discuss advantages and disadvantages of working at a crab farm.
7. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading three articles (a) Career Information Sheet, (b) Kinds of Crabs, (c) Blue Crab Fact Sheet.
2. Completing Self-Inventory.
3. Completing Activity I - Crab Identification.
4. Discussing advantages/disadvantages of working at a crab farm.
5. Completing Student Attitude Sheet.

Self-Inventory

Is This the Job for You?

If you can answer "yes" to these questions, you may enjoy working as a crab farmer's helper.

______ 1. Would you like to live near the ocean?

______ 2. Do you enjoy working with living things?

______ 3. Do you like routine work?

______ 4. Are you good at cleaning various sizes of equipment?

______ 5. Do you have patience to repair things?

______ 6. Would you enjoy working on a boat?

______ 7. Would a federal minimum wage for 40 hours a week provide enough money for the lifestyle you desire to live?

______ 8. Are you strong and healthy?

______ 9. Do you have initiative when forced to work alone?

______10. Do you feel you would be comfortable wearing protective clothing eight hours a day?

Information Sheet

Kinds of Crabs

The crab is an animal that is covered by a hard shell, and that has jointed legs. There are about a thousand different kinds of crabs. Of this large number, many kinds of crabs are valued by mankind as food. Crabs are found in every sea. They may be found living in shallow waters along the shore and also in waters of great depth. Some kinds, such as fiddler crabs, live in burrows in the banks of salty tidal streams. Some live in fresh water or in burrows many yards, or even several miles, ashore.

Some names attached to crabs include:

Hermit Crab
King Crab
Horseshoe Crab
Crab Louse
Fiddler Crab
Pea Crab
Land Crab
Blue Crab

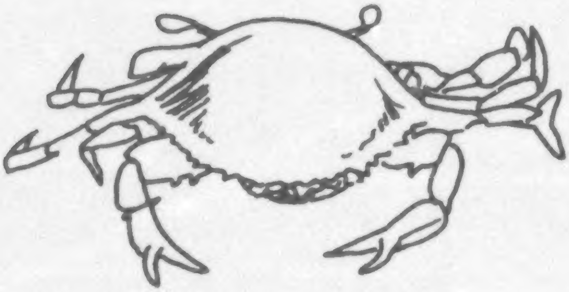
The blue crab is the most common crab sold as food in eastern American markets. When these crabs have shed their shells, and the new ones have not yet hardened, they are sold as the extra-choice soft-shelled crabs.

From the list above, the smallest crabs are the tiny pea crabs. The female pea crabs live in the sheltering shells of live oysters. While the males, which are better armored, live outside and visit about from oyster to oyster, calling on the females.

The shape and relative size of the big claws of crabs differ greatly among the species, according to their habits. Male pincer crabs have one pincer very much larger than the other. The color, form, and texture of claws, legs, and bodies run through many shades and shapes, and from smooth to rough and spiny. Some crabs are swimmers, with paddles on the last pair of legs. Many crabs are fast sideways runners on the seaside sand or rocks.

The Giant Spider Crabs of Japan are the largest known crabs. They may be measured eighteen inches in width across the body, and twelve feet from tip to tip of the outstretched claws.

Blue Crab Fact Sheet

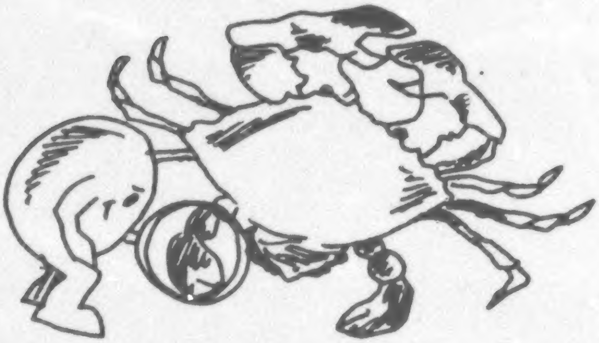


The Blue Crab lives in the shallow water of bays and rivers all the way from Massachusetts to the Gulf of Mexico.

The greenish-brown shell is about four inches from side to side and two inches long. The legs of the crab are blue, and the claws are red-tipped.

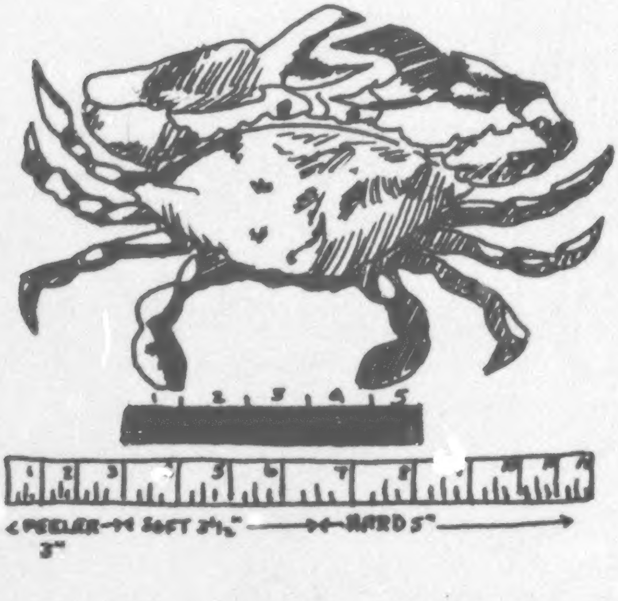
The blue crab is a good swimmer and fights well with its strong claws. It is known as a soft-shelled crab if it is caught soon after shedding the hard coverings of its shell and claws. At this stage the whole crab may be eaten. Soft-shelled crabs are a favorite delicacy.

CRAB IDENTIFICATION



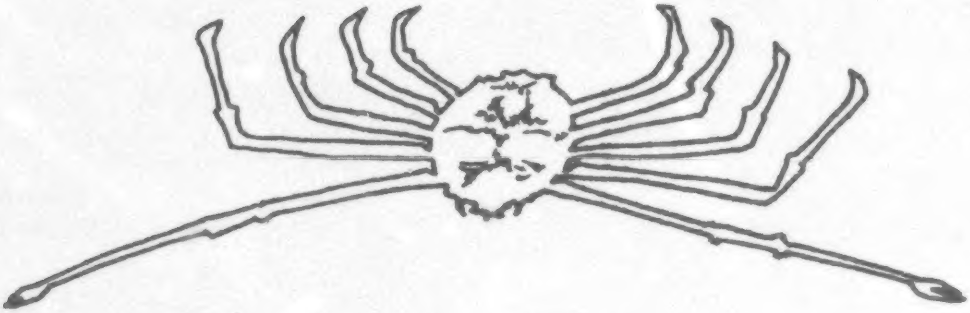
PEELER CRAB	Hard crab which has a soft shell developing beneath outer hard shell. Can also be identified by white, pink, or red line along inner border of backfin as indicated in Fig. 2.
SPONGE CRAB**	Female carrying orange-colored mass of eggs on abdomen as indicated in Fig. 1.
BUCKRAM CRAB	Also known as a paper shell. This condition follows the soft crab stage. Leathery shell is easily cracked.
UNDERSIZED MATURE FEMALE CRAB	Rounded, bell-shaped apron.

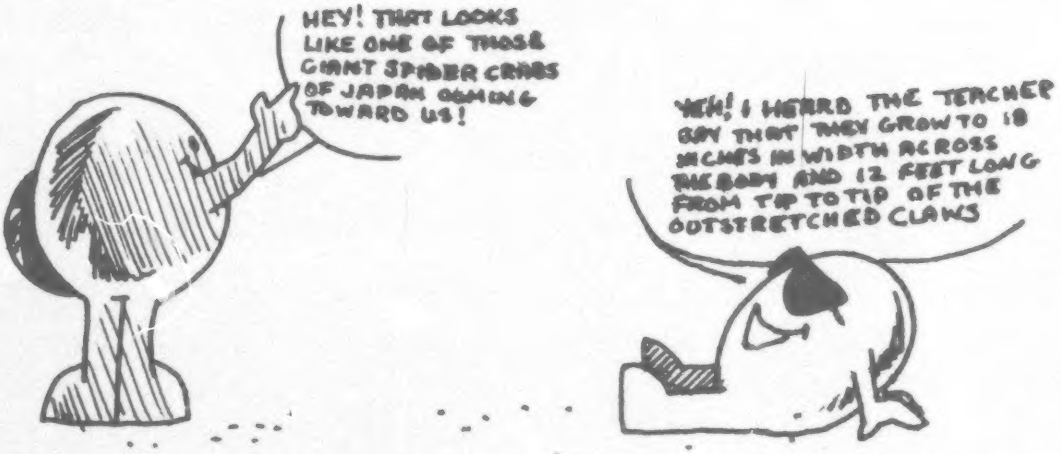
**These crabs are illegal to have in your possession.



MINIMUM SIZES
HARD 5 INCHES
SOFT 3½ INCHES
PEELER 3 INCHES

CRAB IDENTIFICATION




HEY! THAT LOOKS LIKE ONE OF THOSE GIANT SPIDER CRABS OF JAPAN COMING TOWARD US!
YEH! I HEARD THE TEACHER SAY THAT THEY GROW TO 18 INCHES IN WIDTH ACROSS THE BODY AND 12 FEET LONG FROM TIP TO TIP OF THE OUTSTRETCHED CLAWS

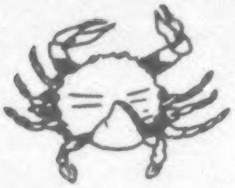
Activity I

CRAB IDENTIFICATION

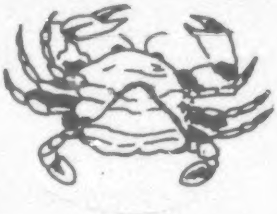
(Continued)

The shape of "Apron" varies with sex and age of each crab.

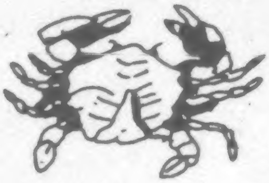
Identify each of the following as either (a) immature female, (b) male (c) mature female.



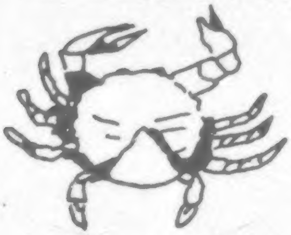
1. ____________



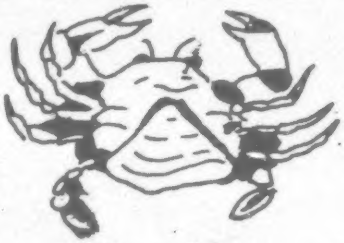
2. ____________



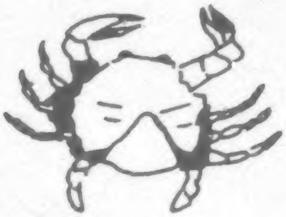
3. ____________



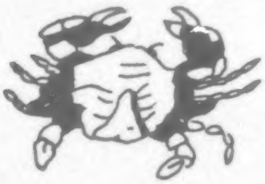
4. ____________



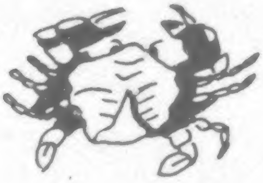
5. ____________



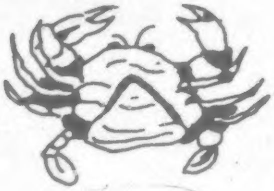
6. ____________



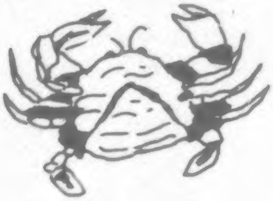
7. ____________



8. ____________



9. ____________



10. ____________

Activity I - Key

CRAB IDENTIFICATION

1. immature female

2. mature female

3. male

4. immature female

5. mature female

6. immature female

7. male

8. male

9. mature female

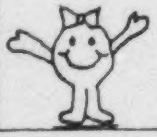
10. mature female

Name ____________________

Occupational Cluster Marine/Fresh Water - Crab Farmer's Helper

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Identifying Crabs in Activity I					
Learning about different "Kinds of Crabs"					
Reading Blue Crab Fact Sheet					
Class discussion					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Fish Culturist DOT CODE: 180.167-030

DUTIES:

Fish culturists supervise the day-to-day operations of fish hatcheries, following procedures determined by fish biologists. They monitor electronic instruments which record temperatures, water flows, and other conditions of the water: high voltage equipment, aerators the size of buildings, indoor tanks, and outdoor ponds. Fish culturists watch to see that all equipment is functioning, since a system's failure can result in death of the fish.

These workers supervise work crews that construct ponds, maintain equipment, and perform the tasks necessary for sanitation.

As the fish grow, the culturists sort them according to size, using an automatic sorter with bars that hold back large fish, allowing the smaller fish to swim through. Later, more mature fish are moved to larger tanks indoors and, finally, to concrete raceway ponds outdoors.

Transportation of fish to lakes, streams, and reservoirs is done by tank trucks or boats. Remote lakes that cannot be reached by truck are stocked by dropping fish from a small airplane or helicopter.

Fish culturists may become involved in research projects and/or conduct tours of the hatcheries and answer questions on the care of fish.

WHERE EMPLOYED:

Fish culturists work in State and Federal hatcheries. Some may find employment with private hatcheries, research organizations, and aquariums. Related work may be found with fish farms that raise fish for food or with aquarium stock companies that raise goldfish or tropical fish for sale to pet stores.

EMPLOYMENT OUTLOOK: Employment opportunities are limited and competition for available openings is keen.

EDUCATION AND TRAINING: Educational requirements vary. Some employers prefer high school graduates who have learned (or demonstrates willingness to learn) on the job. However, the trend is to require two years of college-level education in fisheries management, biology, or zoology. A bachelor's degree is now a requirement for some openings. Regardless of the amount of education, at least one year of practical experience is also needed in order to become familiar with all stages in the work cycle.

Experience with high-voltage equipment, plumbing, machinery repair, or the use of farm equipment is also helpful in obtaining a job with fish hatcheries.

SPECIAL QUALIFICATIONS: Persons aspiring to work at fish hatcheries should be conscientious and constantly aware of the seriousness of their work and the consequences of error.

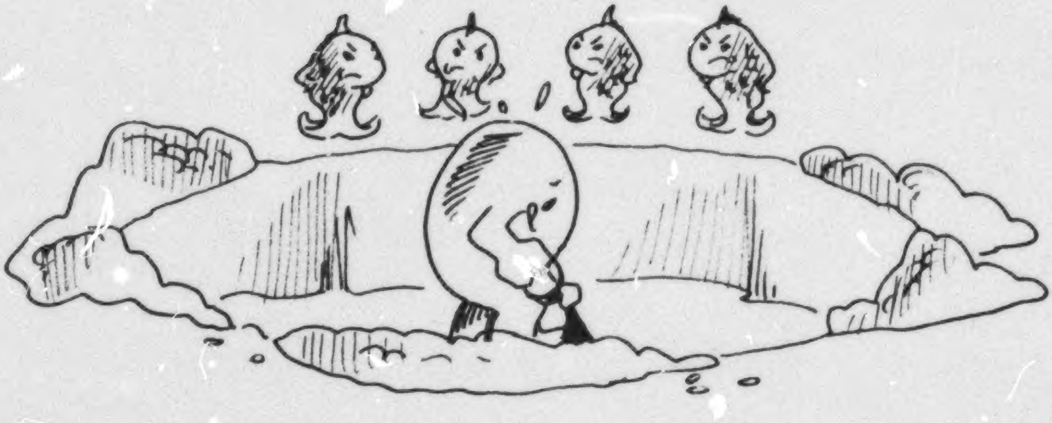
Aspirants to this career should be able to get along well with others. Other desirable traits include good health, patience, perseverance, and emotional stability.

EARNINGS AND ADDITIONAL BENEFITS: The incomes for fish culturists will depend upon their education, professional experience, and individual abilities. Those persons employed by Federal or State governments may probably expect more fringe benefits and higher salaries than those employed by private enterprises.

WORKING CONDITIONS AND LIFESTYLES:

Usually the fish culturist must live in a trailer or cabin next to the hatchery and be on call at night in case of an emergency. Emergencies are most apt to occur in bad weather, and it is often necessary to go outdoors and check equipment in snow, wind, or thunderstorms.

A large part of the culturist's time is spent on sanitation, which means cleaning tanks and equipment that come in contact with fish.



ENVIRONMENTAL OCCUPATIONS

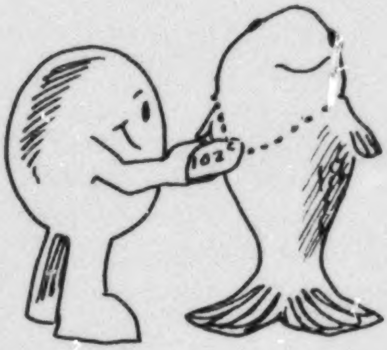
OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:	Fish Culturist	180.167-030
	Manager, Marine Life Hatchery	180.167-030
	Manager, Shellfish Hatchery	180.167-030

OCCUPATIONAL TASK: Exploring the work of a fish culturist

OCCUPATIONAL COMPETENCY: Tagging fish



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A
3. Activity Sheet: Tagging Each Fish
4. Student Attitude Sheet

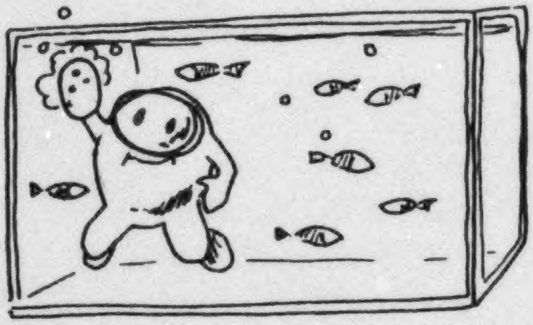
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand work performed as fish culturists.
2. Evaluate yourself as a fish culturist.
3. Determine if you would like this type of work.

LEARNING ACTIVITIES

1. Read and discuss Career Information Sheet on fish culturist.
2. Study 10 terms listed on Mastering Vocabulary which may be placed on a transparency or written on the chalkboard.
3. Read Information Sheet A. (Other suggestions for use: tape recording, cut each section and place in an envelope, or in a balloon.)
4. Complete Activity Sheet: Tagging Each Fish.
5. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

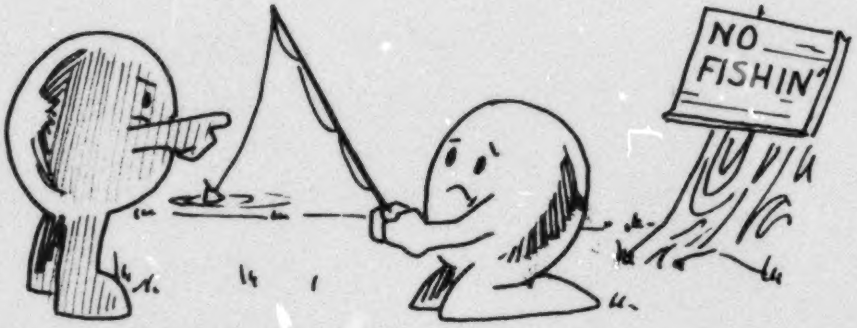
Your evaluation will consist of:

1. Participation in discussion of Career Information Sheet and Facts You Should Know About Hatcheries.
2. Completing Activity Sheet: Tagging Each Fish.
3. Completing the Student Attitude Sheet.

DESTROYERS OF FISH

Many times people abuse fish that are found in their habitat of streams, rivers, and/or lakes. Some of the ways which have attributed to forced regulation of commercial fishing and restocking of inland waters include the following:

1. Overfishing
2. Spread of cities
3. Sewage and industrial wastes dumped into rivers and lakes
4. Dams blocking fish traveling upstream to spawn
5. Drainage projects destroy fishing grounds
6. Soil erosion, by filling the stream with silt, kills the plant foods of fish, covers their spawning beds, and reduces the oxygen in the water so they cannot breathe.



Mastering Vocabulary

1. spawn: to produce or deposit (eggs, sperm, or young) in great quantity

2. aerated: exposed to air, or to have caused air to circulate through; to have supplied oxygen to

3. "runs": pools where newly hatched fish grow undisturbed

4. "fry": very young fish who have not begun to feed

5. "advanced fry": young fish less than one inch in length

6. "fingerlings": fish that are at least one inch in length and less than one year old

7. "yearlings": fish that are between one year and two years old

8. roe: fish eggs, especially when still massed in the ovarian membrane

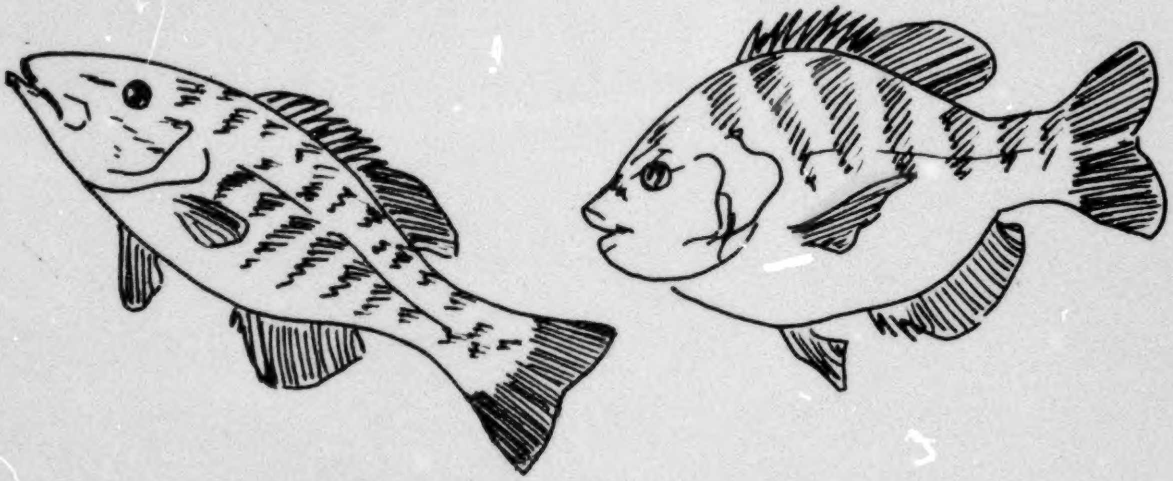
9. entrails: inner organs of fish; intestines, guts

10. milt: reproductive glands of male fishes

Information Sheet A

Facts You Should Know About Hatcheries

1. In the hatchery of a fish culture station, the eggs are stripped from the females and fertilized by mixing with milt from the male.
2. Fertilized eggs are kept in pure aerated water at temperatures proper for their development.
3. In Pacific salmon hatcheries, the fish are killed before the eggs are removed.
4. In fish hatcheries, at least 80 percent of eggs are hatched compared to 15 percent that are hatched on natural spawning grounds.
5. Eggs can be sent long distances if packed in moss and ice.
6. Fish are tagged at hatcheries so that we can learn something of their migration and life history.
7. In tagging a fish, a metal or celluloid disk is attached to one of the fins, the jaw, or gill cover.
8. Bluegill and largemouthed black bass are most suitable for farm ponds.
9. When fish are ready to be released into streams and lakes, they are moved from the hatchery in specially constructed tank trunks.
10. Fish is one of the chief sources of protein.



ACTIVITY SHEET
"TAGGING THE FISH"

Draw a line from the information which best describes the fish to the corresponding alphabet letter.

1. Fresh-water fish related to the salmon; lives in cold clear streams or lakes with gravelly bottoms; will take many kinds of lures and bait.

2. Fresh-water rough fish with greenish gray body; hardy and can stand a wide range of temperatures.

3. Large salt-and fresh-water fish with slender, elongated body covered with bony plates; large specimens 10 ft. long, weighing 500 lbs.

4. Soft-rayed, smooth-scaled fresh-water fish; attractive to sportsmen because of gameness and fighting strength.

5. Color varies from yellow to blue; flesh very sweet and appetizing.

a. trout

b. carp

c. sturgeon

d. pickerel

e. perch

ACTIVITY SHEET KEY
"TAGGING THE FISH"

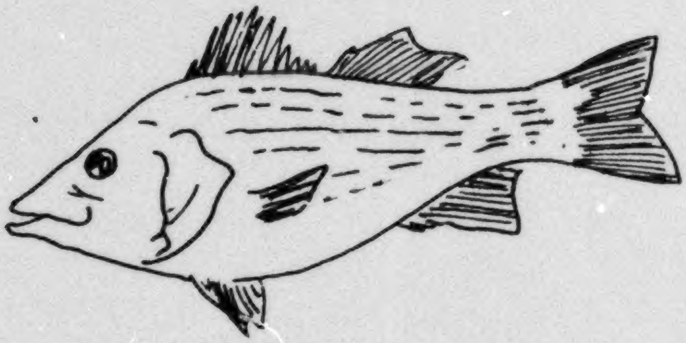
1. e (perch)

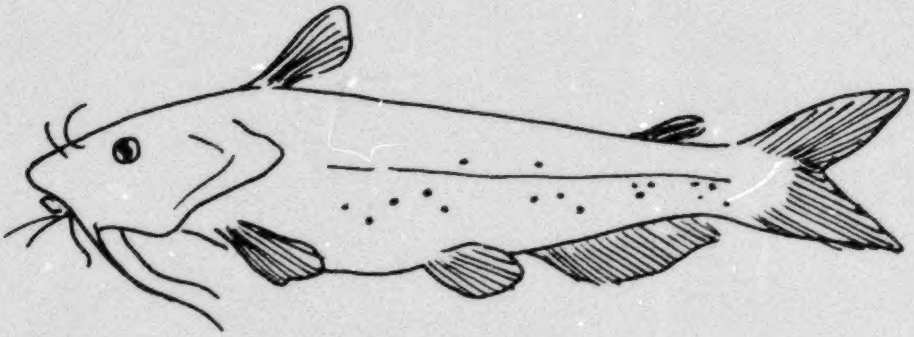
2. c (sturgeon)

3. a (trout)

4. d (pickerel)

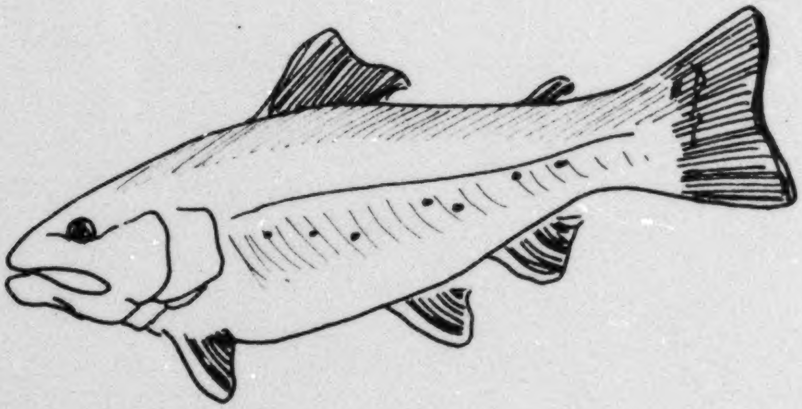
5. b (carp)





FISH HATCHERIES
LOCATED IN WEST VIRGINIA

NAME	COUNTY	ACRES OF LAND
Big Springs	Mercer	126
Edray Trout	Pocahontas	29
Palestine	Wirt	127
Petersburg Trout	Grant	9
Reeds Creek	Pendleton	12
Ridge	Morgan	35
Spring Run Trout	Grant	42
Stony Creek Rearing Ponds	Pocahontas	9



Name ______________________________

Occupational Cluster Marine/Fresh Water - Fish Culturist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading and discussing Career Information Sheet					
Mastering Vocabulary terms					
Reading "Facts You Should Know About Hatcheries"					
Tagging fish					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Oyster Floater **DOT CODE:** 449.687-010

DUTIES:

An oyster floater spreads freshly harvested oysters in shallow barges or floats which are constructed in such a way to allow water to flow over the oysters to afford temporary oyster storage.

Oysters taken from beds exposed to sewage are usually "floated" in water of specified degrees of salinity designated by health authorities until the oysters are free of impurities.

WHERE EMPLOYED:

Persons aspiring to work in the oyster business may find opportunities for employment in places located from Maine to Florida, in the Gulf of Mexico, in San Francisco Bay, and in the coastal waters of Washington and Oregon. The states which lead in oyster production include Virginia, Maryland, Louisiana, and Washington. Baltimore is one of the chief markets of the industry on the East Coast.

EMPLOYMENT OUTLOOK:

The employment outlook for oyster floaters is most favorable. Oysters are a very popular sea food, and oyster fishing is a large industry. Consequently, it is expected to be a great demand for oyster floaters at least in the four states leading in oyster production.

EDUCATION AND TRAINING:

Because of the necessity for having to work with other people and business transactions, a high school education is preferred. Courses pertaining to marketing, marine biology, navigation, and/or marine technology offered by vocational-technical schools and/or colleges is highly recommended. On-the-job training can be received by working as a helper on the boats designated for harvesting oysters.

SPECIAL QUALIFICATIONS:

Persons aspiring to work in oyster production and harvesting should be exceptionally rugged, strong, and able to endure periods of hard work. These employees should be self-contained, courageous, and patient to work under the varied conditions associated with this vocation. As members of a crew, these workers should be adaptable and able to work well with other people.

EARNINGS AND ADDITIONAL BENEFITS:

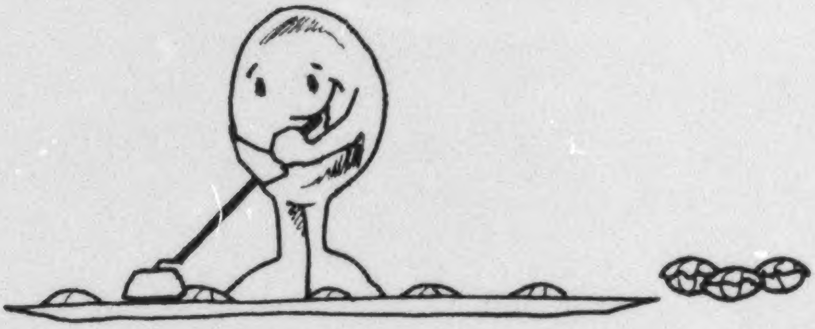
Earnings for persons employed as oyster floaters will vary according to the place of employment and the years of experience of the worker. Oyster floaters can expect to earn at least $10,000 a year. Those persons who are self-employed in producing oysters may expect to earn approximately $17,000 to $25,000 a year depending upon their investment and the demand for oysters during harvesting time.

WORKING CONDITIONS AND LIFESTYLES:

These employees work out-of-doors most of the time. The oyster-harvesting season is in the fall and winter. In shallow water, the shells are scooped out of the sea with huge tongs, or pincers, which open and shut like shears. In deeper waters, the catch is taken by dredges which are operated by either hand or steam power.

In some hatcheries and growing grounds, the brood stock is maintained permanently in shallow plastic trays through which natural seawater is kept running. Cultural rooms are very comfortable.

During the harvest time, these employees may have to work from sunup until dusk. Sometimes, they must work in the cold winter wind accompanied by salty spraying water.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

Oyster Floater	449.687-010
Soft Crab Shedder	446.684-018
Clam Sorter	446.687-010

OCCUPATIONAL TASK: Exploring types of marine life

OCCUPATIONAL COMPETENCY: Identifying an important food source in marine habitat

RESOURCES and/or MATERIALS

1. Read Career Information Sheet
2. Tape recording - "YOU ASK ME WHY I AM HAPPY"
3. Visual (Drawing or transparency) - "COME TO SEE ME SOMETIME"
4. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss the habitats of oysters.
2. Appreciate persons employed in producing oysters in order to provide a source of food.
3. Determine the advantages and disadvantages of working as an oyster floater.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Listen attentively to reading of "YOU ASK ME WHY I AM HAPPY."
3. Study visual of "COME TO SEE ME SOMETIME."
4. Complete the Student Atitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Listening attentively to "YOU ASK ME WHY I AM HAPPY."
3. Studying visual of "COME TO SEE ME SOMETIME."
4. Completing and submitting the Student Attitude Sheet to the teacher.

"YOU ASK ME WHY I AM HAPPY"

I belong to a very large, important family, The Oysters, and I reside in Oystersville, U.S.A. In fact, members of my family have become very prominent in eight states - Virginia, Maryland, Louisiana, Washington, New Jersey, New York, South Carolina, and Alabama. The people in these states enjoy our families residing there because we are easy to manage and at harvest time when we are gathered and sold we bring them lots of money.

The oyster family has the capability of increasing rapidly. For example, my mother, who is just of average size and, of course, from the eastern American coastline, may produce as many as 16,000,000 eggs in a season. Think of that - 16 million eggs! Of course, if we are out in the ocean, some of the eggs do not hatch because other hungry marine animals are there to devour them before they have time to hatch. Let me tell you one thing though, about ten hours after the eggs are fertilized, the baby oysters are hatched and able to swim. Did you understand that? The baby oysters are able to swim. Now, it's important to remember that at this time of our life cycle, we are labeled larvae. We are only about the size of a needle point. Perhaps you wonder how we are able to swim. Well, we swim by means of cilia, hairlike growths which help us to move smoothly through the water. I might add, that a rudimentary shell begins to form within the next twenty-four hours. This shell serves as our home. It's really neat!

Our shell is divided into two halves, called valves. These valves are fastened together at one end by a hinge. A strong muscle, called an adductor muscle, attaches our soft body to the shell so that we can open the valves about half an inch, and close them as we so desire. We stay in the left valve of the shell. Sometime when you have an opportunity to look closely at an oyster shell, examine how the layers overlap like shingles on a roof. This is caused by a fold of tissue, a mantle, which grows from each side of our body and secretes layers of limy substance which make up our shell.

Occasionally, when we open our valves to allow water and food to pass through, a parasite or some other object becomes lodged on the inside of the shell. Some of our distant relatives can secrete lime over the object, and in time, a pearl is formed. Perhaps you may want to read more about our relatives who provide pearls. This, too, is a money-making project and a definite reason why many people try to protect the cities of Oystersville around the world. Well, I need to get back to telling you more about my closest kin, edible oysters.

During the first two weeks in this world, the young oysters are kept busy swimming about looking for a place to rest. Young oysters have the responsibility for testing objects with their feet, which serve as feelers. When we find a place that seems satisfactory, we fasten ourselves to that spot. We aren't very mobile once we have become settled. In fact, most of us stay in that one spot the rest of our lives.

Once the young oysters have established living quarters, the primitive shell starts forming, and the larvae develop into adult oysters. It takes about one month for young oysters to grow to the size of a pea. By the end of the first year, under normal conditions, we have grown about the size of a silver quarter. After that growth occurs, we develop about an inch a year until maturity which is completed by the end of three or four years.

Unfortunately, many of our relatives do not live to become adults. While the oyster families are happy living in their own habitat, often they are attacked by starfish, snails, and other hungry enemies. One of these, the boring snail, pierces our shells with its rasping tongue, and draws out the soft oyster. A news release the other day stated that one scientist had figured that only one oyster out of every 1,145,000 reaches adult size. Gosh! I am really happy that I have made it in the ocean world for the past two years.

Perhaps one reason I am still around to tell this story is that when Mr. Seafood Farmer started to prepare a place for our oyster families he did some long-range planning. He marked out a section of the water with buoys so that he could be sure to know exactly where we would be.

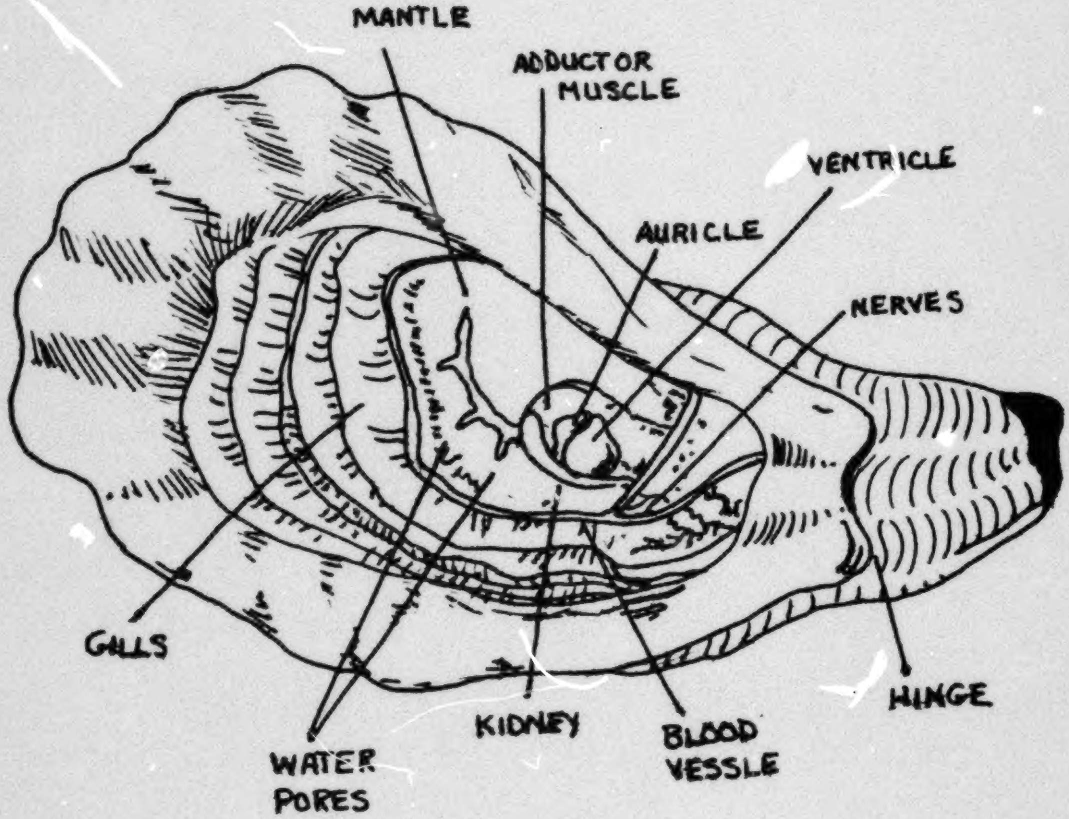
He dragged the bay bottom and then vacuumed to free it of silt. He had someone to treat the area with calcium oxide to kill starfishes and with a chlorinated benzene to kill oyster drills. Later, he placed dead shells and tiles on the ocean floor. This surely did made it more easy for our generation to find comfortable places for lodging.

From time to time, he attaches ropes to wooden frames and suspends them into the water. Our oyster families can grow faster and are less subject to predators and pests if we are suspended on ropes or other material rather than being left on the bottom, as we normally are.

Hopefully, this narrative has given you some additional insight about our oyster families. Our main purpose in life is to survive until we reach maturity so that we can serve as a source of food to the human race. You see, we contain the water, protein, fat, and ash which are found in all meats and fish food. We also contain over three per cent of carbohydrates, or starches and sugars.

I heard two fishermen say the other day that there is about the same amount of nourishment in a quart of oysters as in a quart of milk or two pounds of fresh codfish, or a pound of bread, or three fourths of a pound of beef. Also, if you don't really have the time to fry us, you can serve raw oysters, seasoned with salt, pepper, lemon, catchup, or other sauce as an appetizer. Your mothers may decide to include us in a hearty meal either broiled, fried, scalloped, or as an oyster stew. Remember, the next time you have an opportunity to choose your food that oysters are happy because they have survived until maturity, have been harvested and processed properly, and can make a contribution to mankind's regular diet. We in Oystersville, U.S.A. salute people working as oyster floaters. They really care!

"COME TO SEE ME SOMETIME"

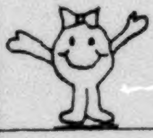

MANTLE
ADDUCTOR MUSCLE
VENTRICLE
AURICLE
NERVES
GILLS
HINGE
KIDNEY
BLOOD VESSLE
WATER PORES

Name ______________________________

Occupational Cluster Marine/Fresh Water - Oyster Floater

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Hearing "YOU ASK ME WHY I AM HAPPY"					
Studying visual of "COME TO SEE ME SOMETIME"					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Shellfish Grower DOT CODE: 446.161-014

DUTIES:

A shellfish grower cultivates and harvests beds of shellfish, such as clams and oysters. This worker lays out and stakes tide flats (ground beneath shallow water near shoreline). S/He piles up stone, poles, and mud, using farm tractor and hand implements to make dikes to control water drainage at low tide. The bed for the shellfish must be prepared by removing all debris by hand and then leveling the soil with a tractor and harrow.

After the shellfish bed is prepared, s/he sows spat by hand or with shovel or sets out strings or baskets of shells onto which spat attaches. The seeded area is then covered with a mixture of sand and broken shells. The seeded strings or baskets are moved to a designated growing area.

From time to time, this employee rigs a net or star mop (mop of heavy rope yarn) and drags it over a shellfish bed behind a power boat to entangle and remove shellfish predators, such as crabs and starfish. S/He walks close to the shellfish bed at low tide and scoops or digs shellfish and piles them onto barge or mud sled by using a pitchfork or shovel.

After the shellfish have reached maturity, s/he packs them, according to market specifications, in containers and returns small ones to bed. When gathering shellfish from a boat, s/he may reach from the boat with raketongs and grope for shellfish by moving handles to open and close tongs.

Lastly, this employee may supervise workers who cultivate and harvest shellfish beds and/or negotiate with buyers for the sale of a shellfish crop.

WHERE EMPLOYED: Persons interested in working as shellfish growers should visit a farm and talk to the owner about a job. There are many shellfish farms along the Atlantic and Pacific coasts of the United States.

EMPLOYMENT OUTLOOK: Employment is expected to grow about as fast as the average for all occupations through the 1980's. People will probably continue to eat seafood such as clams and/or oysters. Because much of our seafood is imported from other countries, the number of job openings for shellfish growers may be more limited.

EDUCATION AND TRAINING: Because of having to work well with other people and/or conducting business transactions, a high school education is preferred. Courses in high school which may help employees to work well with their hands are recommended. Shop or art classes are good training. Classes in social studies may provide insight to the fishing industry and various seafoods.

The training for a shellfish grower is received on the job. The employer usually works with the employee until s/he can work well alone.

SPECIAL QUALIFICATIONS: These workers should be able to use their hands easily. Good eyesight is necessary. Good health and strong bodies are also necessary in order for outdoor work under sometimes adverse weather conditions.

EARNINGS AND ADDITIONAL BENEFITS: Shellfish growers are usually paid a minimum wage for each hour worked.

Sometimes the employer may pay the employees extra money when an unexpected amount of shellfish is caught and processed. Earnings and fringe benefits may vary depending upon the employer and his/her profit earned each year.

WORKING CONDITIONS AND LIFESTYLES:

These employees work out-of-doors most of the time. The shellfish harvesting season is in the fall and winter. In shallow water, the shells are scooped out of the sea with huge tongs which open and shut like shears. In deeper waters, the catch is taken by dredges which are operated by either hand or steam power. In some growing grounds, the brood stock is maintained permanently in shallow plastic trays through which natural seawater is kept running. Cultural rooms may be very comfortable.

During harvesting time, these employees may have to work from sunup until dusk. Sometimes, they must work in the cold winter wind accompanied by salty spraying water.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Marine Life Cultivation

REPRESENTATIVE JOB TITLES:

Shellfish Grower	446.161-014
Shellfish-Bed Worker	446.684-014
Shellfish Dredge Operator	446.663-010

OCCUPATIONAL TASK: Identifying shells

OCCUPATIONAL COMPETENCY: Using shells in creative art

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A - TYPES OF SHELLS
3. Information Sheet B - USES OF SHELLS
4. Activity Sheet A - TREASURES FROM THE SEA
5. Student Attitude Sheet

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of shellfish growers.
2. Become more familiar with different types of shells.
3. Appreciate products of nature more.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Discuss Information Sheet A - TYPES OF SHELLS.
3. Become familiar with and discuss Information Sheet B - USES OF SHELLS.
4. Complete Activity Sheet A - TREASURES FROM THE SEA.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participation in class discussions of Information Sheets A and B.
3. Completing Activity Sheet A.
4. Completing the Student Attitude Sheet.

INFORMATION SHEET A - TYPES OF SHELLS

Shells are the hard coverings of various animals. A shell is made up largely of carbonate of lime. This substance is given off by the mantle, the outer covering of the soft body. Quite often, shells on mollusks consist of three layers:

1. periostracum - outer layer which forms the protective covering on most shells.
2. prismatic - second layer inside the shell, made up of prisms, and determines color pattern of the shell.
3. nacreous - inner layer, smooth and shining and is often called mother-of-pearl.

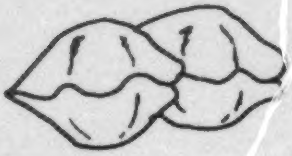
The mollusk continues to add to and repair its shell throughout its life. These shells are the most popular in collections.

Five Major Classes of Mollusks

Each class of mollusk has a distinctive type of shell. The following information is prepared to give insight to these shells.

	NAME	EXAMPLE	DESCRIPTION
1.	AMPHINEURA	Chitons	Eight transverse plates which are held together by a band or girdle.
2.	GASTROPODA	Snails	Shell is made of only one piece; may be coiled; great difference in sizes; live in depths of the sea, along the seashore, in fresh water, and on land.
3.	PELECYPODA	Oysters, clams, and scallops	Two valves or sides and live in both salt and fresh water.

	NAME	EXAMPLE	DESCRIPTION
4.	SCAPHOPODA	---	Long shells like a tube, made of only one piece; openings at both ends; found only in the ocean.
5.	CEPHALOPODA	Squid, cuttlefish, octopus, nautilus	Small shells which are inside the bodies; all live in the ocean.



INFORMATION SHEET B - USES OF SHELLS

The shellfish grower has opportunities to see a variety of shells. These shells have many different uses. Perhaps the following information will assist you in learning more about some of the uses of shells.

a. To make buttons

b. To make knife handles

c. Beautiful cameos

d. Inlaying fancy boxes, musical instruments, and wall panels (inner layer of the oyster shell, mother-of-pearl)

e. Lime

f. Covers floor of ocean for newly-hatched oysters to make a home

g. Building roads (oyster shells are used in Bermuda Islands)

h. Substitute for glass in windows (Philippine Islands)

i. Money

j. Ready-made currency (In Africa and India, the small cowrie shell is used.)

ACTIVITY SHEET A
TREASURES OF THE SEA

Many times when people are vacationing at the beach, they find shells that have washed to shore by the waves. Perhaps you may have a collection of some of these shells. The following activities are challenges for you to select and develop one useful item from sea materials.

1. Choose a shell, glue an eye-pin onto it, and attach it to a ribbon or a choker band.

2. Select several shells of different sizes and construct a mobile.

3. Using a larger shell or piece of driftwood, attach a candle in the center portion and cement other sea materials at base of candle.

4. Assemble broken pieces of shells and/or stones into a creative pattern on colored paper or wood. What does your pattern portray?

5. Construct a memory box of sea materials. You may choose to use a 2" x 10" dress or shirt box and place dividers to separate the various items.

6. Using approximately the same size shells, construct a bracelet and/or full necklace.

7. Arrange some sea shells in a planter.

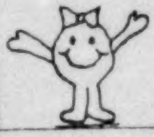
8. Place shells in an aquarium.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Shellfish Grower

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading the Career Information Sheet					
Class discussions of TYPES OF SHELLS					
Class discussions of USES OF SHELLS					
Using shells in developing a creative art					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Hydrographer DOT CODE: 025.264-010

DUTIES: Hydrographers analyze hydrologic data to determine trends in the movement and utilization of water. They measure waterflow and pressure in streams, conduits, and pipelines and record the data. They collect data by measuring water levels in lakes, reservoirs, tanks, rivers, and navigation pools. They measure the depth of water in wells and test holes to determine the ground water level. They sometimes measure snow characteristics to evaluate the water field from snow runoff. They calculate seepage and evaporation rates for dams and reservoirs.

Hydrographers prepare graphs, tables, and charts to represent water patterns. Oftentimes, they work on more complex hydrologic investigations and studies. Other duties may include preparing discharge forecasts or reservoir manuals, planning reservoir regulation to provide flood protection downstream, and other tasks.

WHERE EMPLOYED: A limited number of hydrographers work for the Federal Government, for State agencies, and in private industry.

EMPLOYMENT OUTLOOK: There should be openings for qualified hydrographers throughout the next decade. The employment outlook is favorable, particularly for those with advanced degrees.

EDUCATION AND TRAINING: In some instances, a person with a high school education could begin as an aide and, through on-the-job training, advance to the position of hydrographer.

Some employers prefer a person with a bachelor's degree and a strong background in courses such as English, industrial or environmental technology, drafting, survey work, and especially mathematics. Experience can usually be substituted, in part, for the education requirements. However, an engineering degree is probably necessary to advance to professional level positions.

SPECIAL QUALIFICATIONS:

Good manual and finger dexterity are important in maintaining equipment, taking measurements, and preparing charts and graphs using drafting tools. Good eyesight is needed for accuracy in readings and computations of data.

EARNINGS AND ADDITIONAL BENEFITS:

Depending upon the amount of education and experience, salaries for hydrographers may range from $12,500 to $30,000 a year.

WORKING CONDITIONS AND LIFESTYLES:

Hydrographers may be required to work outside much of the time in inclement weather while collecting data and performing field surveys. This work requires medium strength to set up, adjust, and repair recording equipment.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

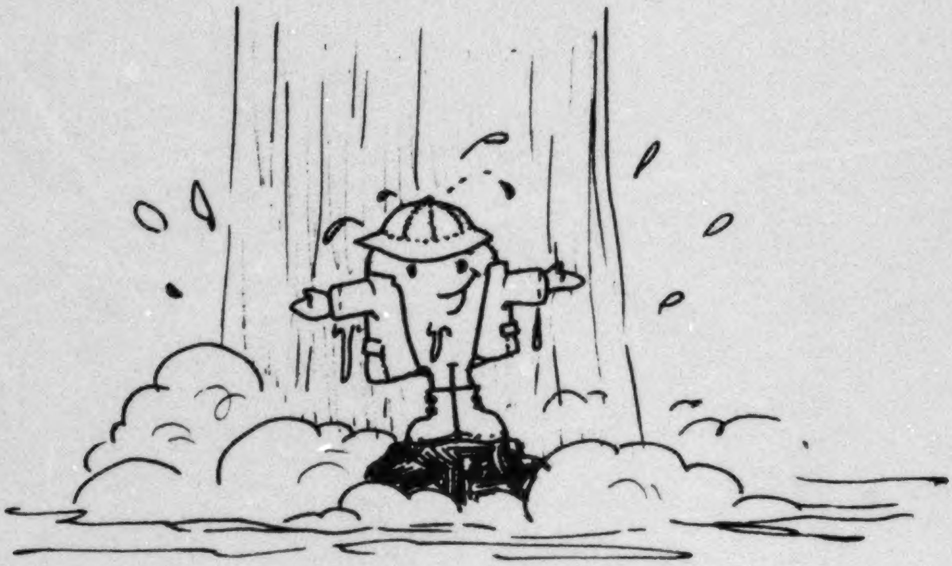
OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Hydrographer	025.264-010
Oceanographer, Assistant	025.267-010
Meteorologist	025.062-010

OCCUPATIONAL TASK: Measuring water power

OCCUPATIONAL COMPETENCY: Estimating the horsepower of a waterfall



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A
3. Student Attitude Sheet

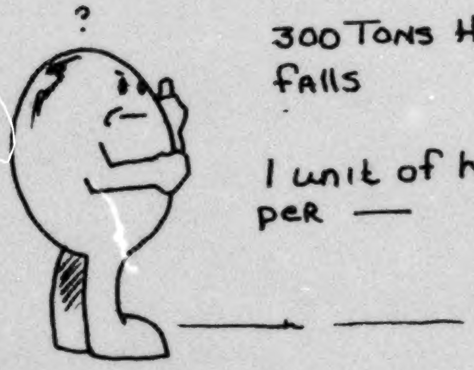
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Understand mathematical procedures for calculating the horsepower of a waterfall.
2. Appreciate the duties being carried out by hydrographers.
3. Determine if you want to pursue this field of work further.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Complete Activity Sheet A.
3. Complete the Student Attitude Sheet.



300 TONS H_2O/hR fAlls

1 unit of horsepower per —

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Completing Activity Sheet A.
3. Completing the Student Attitude Sheet.

Activity Sheet A

Hydrographers are involved in analyzing hydrologic data to determine trends in the movement and utilization of water.

Man has built devices which have provided ways for water power to be utilized to use the energy found in water as it moves from higher to lower places on the surface of this earth. Thus, in using this water power, man is harnessing the effects of gravity upon the water. The pull of gravity gives a weight of 62.4 pounds to every cubic foot of water.

Water power is usually measured by the horsepower unit. Given the following information, calculate an estimate of the horsepower of a waterfall.

One horsepower = force that will raise
33,000 pounds one foot in one minute
or
550 pounds one foot in one second

Pull of gravity = 62.4 pounds of weight to every cubic foot of water

Problem: Estimate the horsepower that exists in a waterfall 100 feet high with a flow of 500 cubic feet per second.

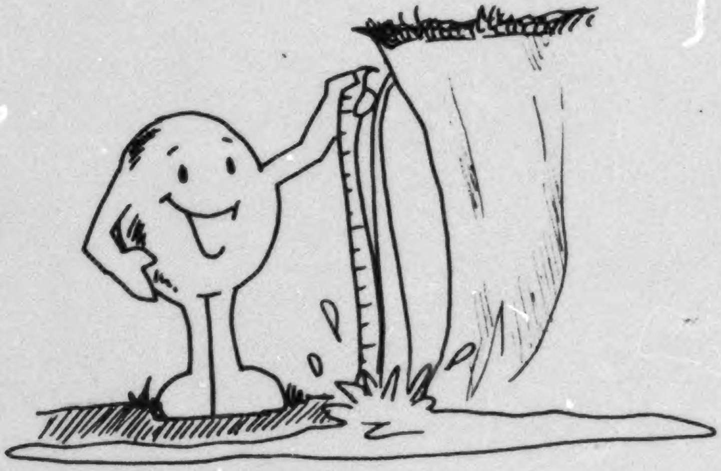
Activity Sheet A - Key

(a) Pounds of weight to every cubic foot / Pounds one foot

$$\frac{62.4}{550} = .113$$

(b) Solution: Estimate the horsepower that exists in a waterfall 100 feet high with a flow of 500 cubic feet per second.

100 x 500 x .113 = 5,650 horsepower



Name ______________________________

Occupational Cluster Marine/Fresh Water - Hydrographer

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet - Hydrographer					
Calculating the horsepower of a waterfall					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Hydrologist

DOT CODE: 024.061-034

DUTIES:

Hydrologists study the distribution, disposition, and development of the waters of land areas, including the form and intensity of precipitation, and the modes of return of water to the ocean and the atmosphere. Hydrologists study the water cycle, both above and below the ground.

Hydrologists map and chart water flow and disposition of sediment. They measure changes in water volume as a result of evaporation and melting snow. They study the nature and movement of glaciers, storm occurrences, the rate of ground absorption, and the ultimate disposition of water.

Hydrologists evaluate data obtained in reference to such problems as forecasting flood and drought, soil and water conservation, and planning water supply, water power, flood control, drainage, irrigation, crop production and inland navigation projects.

Some hydrologists analyze and forecast oceanographic phenomena and provide information to support shipping, fishing, offshore drilling and mining, and marine recreational activities.

WHERE EMPLOYED:

Hydrologists are employed by Federal, State, and some local governments. Others work for regional or area planning authorities, private industry, research firms, and consulting firms.

EMPLOYMENT OUTLOOK:

There should be openings for qualified hydrologists throughout the 1980's. The employment outlook is favorable, particularly for those with advanced degrees.

EDUCATION AND TRAINING:

A bachelor's degree or higher with a major or approximately 30 hours in a physical or natural science or engineering is usually the minimum requirement for entry into this work.

A solid background in physics, chemistry, and mathematics is an important requirement for hydrology work. Other courses such as geophysics, geology, forestry, meteorology, oceanography, and biology are also valuable to the hydrologist, depending upon the area of his/her specialization. A course in computer systems fundamentals is also valuable in many positions.

SPECIAL QUALIFICATIONS:

Manual and finger dexterity, good eyesight, and coordination are important in performing the tasks associated with a hydrologist. Other desirable traits include an inquisitive mind, resourcefulness, planning ability, and the ability to write clear, concise technical reports.

EARNINGS AND ADDITIONAL BENEFITS:

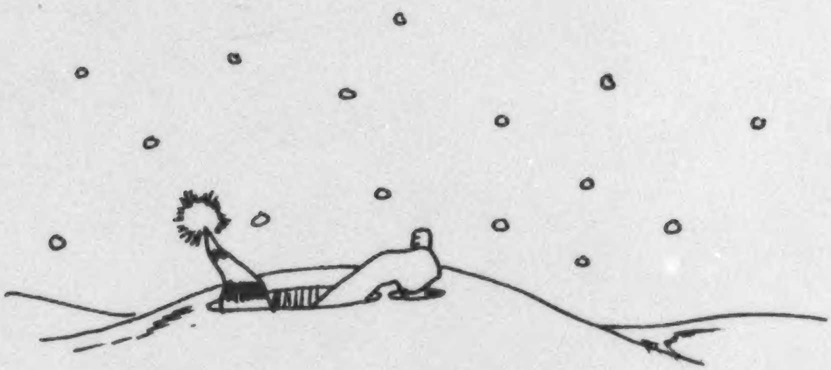
Depending upon the amount of education and experience, salaries for hydrologists may range from $15,000 to $28,000 a year.

WORKING CONDITIONS AND LIFESTYLES:

The work of hydrologists is varied and can involve a part or all phases of the water cycle and pertain to local, national, or even international water problems.

Hydrologists may be required to work shifts because data collection and forecasting continues round-the-clock. This is light physical work requiring considerable walking and standing.

The opportunites for travel, both within and outside the country, offer challenging and interesting possibilities to those who are interested in new faces and places. On the other hand, those whose family ties are strong may not wish to engage in travel.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Hydrologist	024.061-034
Hydrographer	025.264-010
Glaciologist	024.061-030

OCCUPATIONAL TASK: Exploring duties of a hydrologist

OCCUPATIONAL COMPETENCY: Determining rate and direction of flowing water

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet: What Duties Does the Hydrologist Perform?
3. Activity Sheet A
4. Activity Sheet B
5. Flowing water (river, stream, water pouring out of a drain, or gutter at a curb)
6. Small white cards
7. Markers
8. Watch (with second hand)
9. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of the field of hydrology.
2. Appreciate the contributions of hydrologists.
3. Determine if you wish to continue learning about hydrologists.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Study Information Sheet: "What Duties Does the Hydrologist Perform?"
3. Complete Activity Sheet A.
4. Complete Activity Sheet B.
5. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

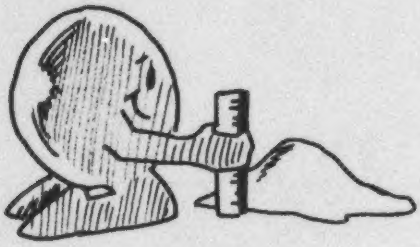
Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Participating in "hands-on" activity on Activity Sheet A.
3. Completing Activity Sheet B: "Can You See Yourself as a Hydrologist?"
4. Completing Student Attitude Sheet.

INFORMATION SHEET

What Duties Does the Hydrologist Perform?

The hydrologist, a specialist in the geophysical family, studies the surface and underground waters of land areas. These specialists leave the seven seas to the family of oceanographers and limit themselves to the rivers, lakes, ponds, and glaciers.

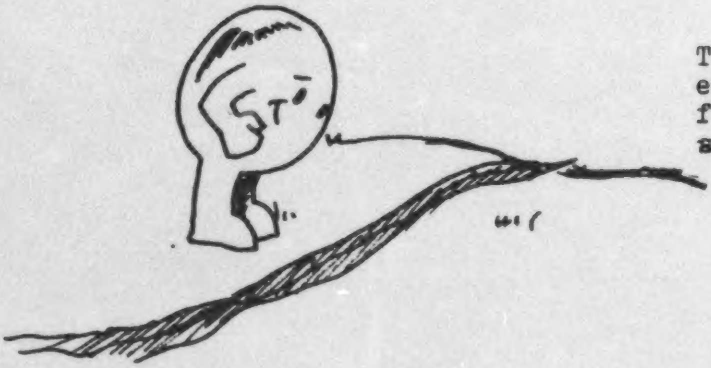


When snow melts, they measure changes in water volume of lakes and rivers.

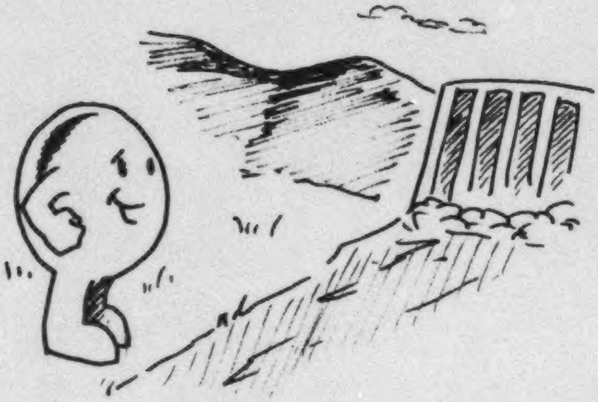
After rainstorms, they study how much water is absorbed into the ground and how much is lost through drainage.

They become active in soil and conservation programs, crop production, and problems of irrigation.

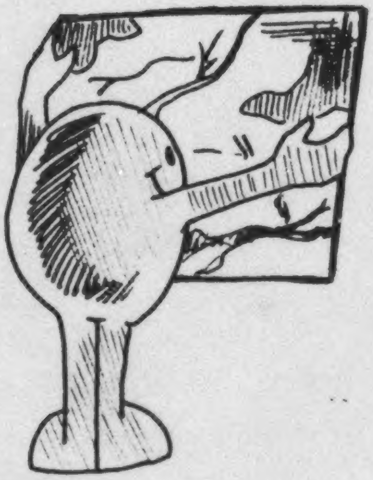
Hydrologists are concerned with flood flow and how it may be controlled.



They study streams to estimate available flow at possible power sites.



They may become involved with production of waterpower for government or industry.



Hydrologists study topographic maps with relation to stream flow, watershed, and natural or artificial drainage basins and reservoirs.

ACTIVITY SHEET A

Determining Rate and Direction of Flowing Water

Determine two points that you want to place markers. Drop one or two small white cards at the upper marker. Calculate the time it takes for the card(s) to travel from the upper marker to the lower marker. Record the amount of time. Repeat this exercise at different times of the day to see if there are variations in amount of time.

Where is the flowing water going?

ACTIVITY SHEET B

Can You See Yourself as a Hydrologist?

(Answer YES or NO to the following)

______ 1. Like indoor and outdoor work

______ 2. Have some mathematical skills

______ 3. Willing to complete a college degree in engineering

______ 4. Interested in water conservation and pollution control

______ 5. Be willing to work both alone and with others

______ 6. Desire scientific and technical tasks

______ 7. Interested in studying topographic maps with relation to rivers, lakes, ponds, and glaciers

______ 8. Prefer a full-time job with regular hours

______ 9. Interested in receiving medium to high pay

______10. Have excellent health and physical strength

Name ______________________

Occupational Cluster Marine/Fresh Water - Hydrologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Studying duties of hydrologists					
Determining Rate and Direction of Flowing Water					
Responding to "Can You See Yourself as a Hydrologist?"					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________

CAREER INFORMATION SHEET

JOB TITLE: Ichthyologist DOT CODE: 041.061-090

DUTIES: Ichthyologists are biological scientists who specialize in the study of fish. Basic ichthyology provides opportunities to work in any one of a combination of the following areas: teaching, research, gathering technical knowledge, lecturing and writing. The majority of these professionals teach in colleges and universities where they prepare curriculums, conduct classroom and laboratory sessions, supervise field trips, advise students, and serve on various committees. They frequently perform research concerned with developing new theories, processes, and equipment; studying the effects of environmental factors on fish populations; gathering samples or specimens; testing equipment; and analyzing, interpreting, and preparing reports on their findings.

Applied Ichthyologists (sometimes called Fisheries Biologists) work in areas concerned with management, conservation, hatching, rearing, population, disease control, use, and catching of fish and fishlike form. They may be engaged in planning, establishing, and managing a sport fishery; making studies of commercial fishing catches; developing fishing gear; and many other projects.

WHERE EMPLOYED: Ichthyologists are employed by colleges; museums; aquariums; The U.S. Fish and Wildlife, National Marine Fisheries, Forest, and Public Health Services; commercial fisheries; and businesses that provide consulting services. A smaller number are self-employed.

EMPLOYMENT OUTLOOK: Employment opportunities at the present are limited and competition for available openings is keen. Although some new positions will probably result from the growing use of fish for food, fertilizer, and other products, most Ichthyologists will be needed to replace present scientists who retire or leave the field for other reasons.

EDUCATION AND TRAINING: Aspirants to this career should take a college entrance program in high school with courses in biology, chemistry, physics, mathematics, English, and one or more foreign languages.

Although completion of a bachelor's degree in an aquatic biological science may qualify beginners for employment as assistants or technicians in this field, graduate study (leading to a master's and preferably a doctorate degree) is necessary to qualify for most research, teaching, and administrative positions. It is suggested that aspirants attend an institution which has an established school of fisheries and/or oceanography, with fresh water biologists and oceanographers on its staff.

SPECIAL QUALIFICATIONS: Aspirants to this career should have a high degree of intelligence, keen interest in biology, scientific curiosity, a willingness to continue their studies throughout their careers and the ability to learn to make accurate, detailed observations. They should get along well with others and be able to express themselves clearly both orally and in writing. Other desirable traits include good health, at least average physical stamina, patience, perseverance, and emotional stability.

EARNINGS AND ADDITIONAL BENEFITS: Earnings of Ichthyologists generally range between $10,000 and $30,000 a year, depending on their educational background, experience, and ability, and the size and type of employing organization.

WORKING CONDITIONS AND LIFESTYLES:

Many Ichthyologists work the regular 40-hour week; however, overtime may be necessary when conducting field trips or performing some types of research. Those employed as college teachers or museum curators generally work in well-lighted, adequately equipped surroundings and are provided office space in which to study, and complete paperwork. Research Ichthyologists conduct their studies in laboratories as well as in field locations which may require them to spend extended periods of time on boats, or in tents or cabins in remote areas. Most Ichthyologists work closely with other scientists, technicians, and assistants.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

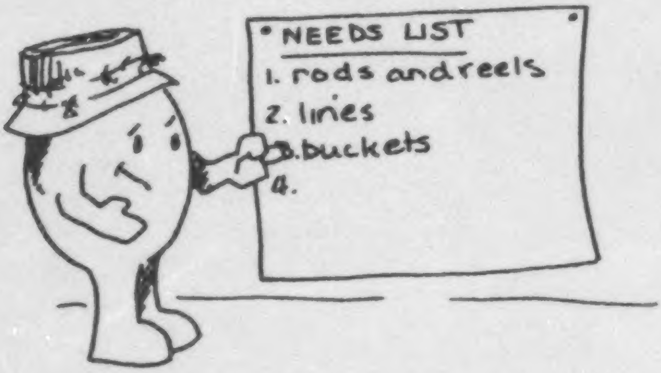
Ichthyologist	041.061-090
Oceanographer, Physical	024.061-030
Microbiologist	041.061-058
Aquatic Biologist	041.061-022

OCCUPATIONAL TASK: Investigating ichthyology

OCCUPATIONAL COMPETENCY: Planning a sport fishery

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet: Planning a Sport Fishery
3. Student Attitude Sheet



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Express your feelings toward starting a sport fishery.
2. Share the contributions made by people working as ichthyologists.

LEARNING ACTIVITIES

1. Become familiar with information with respect to ichthyologists.
2. Complete the Activity Sheet: Planning a Sport Fishery.
3. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the information pertaining to ichthyologists.
2. Completing and submitting to the teacher plans for starting a sport fishery.
3. Completing the Student Attitude Sheet.

Activity Sheet
"Planning a Sport Fishery"

This activity is a challenge for you to brainstorm and plan a sport fishery business for yourself. You will need to determine the physical features for your 300-foot boat that is going to be used for sport fishing. Equip your boat well so that people will want to be served by you during their leisure fishing trips.

You will want to plan for the workers necessary for your sport fishing vessel.

Activity Sheet - Key

Physical features for 300-foot boat.

(a) rods and reels

(b) lines

(c) weights and/or sinkers

(d) bait and buckets

(e) ice container

(f) seats

(g) sonar

(h) rail

(i) first aid

Employees

(a) captain

(b) deck hands

Name ______________________________

Occupational Cluster Marine/Fresh Water - Ichthyologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with ichthyologists					
Planning a sport fishery					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Marine Geologist DOT CODE: 024.061-018

DUTIES:

A marine geologist does research on the contours and deposits of the ocean bottom. S/He studies the heat flow on the ocean floor and may investigate the ocean basins for petroleum and mineral potential.

Sometimes this employee makes models of the ocean bottom showing the great continental shelf, the deeps, mountains, and all the formations which s/he has gathered information about. Part of the work schedule involves conducting geological surveys, drawing maps, taking measurements, and recording data.

A marine geologist may take pictures of the ocean floor and evaluate information from these photographs in addition to using computers to record and analyze data.

Some marine geologists administer and manage research and exploration programs. Others teach and work on research projects in colleges and universities.

WHERE EMPLOYED:

Some marine geologists work for private industries, primarily for petroleum companies. They also become employed with mining and quarrying companies, construction firms, Federal Government in the Department of the Interior in the U.S. Geological Survey, and state agencies. Colleges and universities, nonprofit research institutions, and museums also employ marine geologists.

EMPLOYMENT OUTLOOK:	The employment of marine geologists is expected to grow faster than the average for all occupations through the 1980's. In addition to new jobs created by increased demand for marine geologists, many openings will arise each year as these employees leave the occupation, retire, or die.
EDUCATION AND TRAINING:	A bachelor's degree is recommended for persons aspiring to work as marine geologists. An advanced degree is helpful for promotion in most types of work and is essential for college teaching and many research positions.
SPECIAL QUALIFICATIONS:	Marine geologists often work as part of a team. They should be curious, analytical, and able to communicate effectively.
EARNINGS AND ADDITIONAL BENEFITS:	The earnings of a marine geologist may depend upon the amount of his/her education and the employer for whom s/he works. A range of an expected salary is between $20,600 and $30,000.
WORKING CONDITIONS AND LIFESTYLES:	These workers work down in deep waters most of the time. They may be on a research ship for several days traveling to the site where their research is to be completed and dive down two or three times a day. Sometimes this type of work forces them to be away from home and family for extended periods of time. The work can be very dangerous.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:	Marine Geologist	024.061-018
	Geophysicist	024.061-030
	Hydrologist	024.061-034

OCCUPATIONAL TASK: Exploring marine geology

OCCUPATIONAL COMPETENCY: Researching the contours of an ocean floor

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet I - Instruments Used by Marine Geologists (copies may be made available or a transparency to be shared with the group.)
3. Activity Sheet A
4. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand how the floor of the ocean is shaped.
2. Appreciate the work of marine geologists.
3. Realize the importance for being exposed to various occupations in the Marine/Fresh Water Cluster.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet.
2. Read Information Sheet I - Instruments Used by Marine Geologists.
3. Complete Activity Sheet A. Optional: Divide the class into groups and distribute activities.
4. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Reading Information Sheet I - Instruments Used by Marine Geologists.
3. Completing Activity Sheet A.
4. Completing the Student Attitude Sheet.

Information Sheet I

Instruments Used by Marine Geologists

1. Hammers
2. Chisels
3. Levels
4. Transits
5. Gravity meters
6. Cameras
7. Compasses
8. Seismographs
9. Computers
10. X-ray diffractometer
11. Sonar scanners (side-scan sonar)
12. Magnetic-field surveying equipment

Activity Sheet A

Many marine geologists believe that the continents were once all one great attached land mass. To help you become more knowledgeable of marine geology, complete the following exercises.

1. Examine a map of the east coasts of North and South America and notice the similarity to the western shores of Europe and Africa. Do you think that the edges of the continents could fit together?

2. Since you are unable to visit an ocean floor, research for pictures and construct a map on an 8½ x 11 sheet of typing paper the possibility for an ocean bottom between North America and Europe showing the continental shelf, deeps, and mountains which may develop as a result of using various instruments on a research ship.

3. The literature indicates that there is a fortune in rare and valuable minerals at the bottom of the sea. As a future marine geologist, plan a strategy for mining these minerals. Who should bear the expense? Who should do the work? Who should benefit from the rewards?

4. Marine geologists are constantly watching for tidal waves and other types of danger to mankind. When a marine earthquake is recorded by scientific instruments, a tidal wave watch begins and people are cautioned to be "on the lookout." Prepare a one-minute news release for radio and TV stations to alert people on the eastern coastline of America that a tidal wave is approaching. What states and major cities would need to be alerted?

Name ______________________________

Occupational Cluster Marine/Fresh Water - Marine Geologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it
Becoming familiar with the Marine Geologist occupation					
Learning about some of the instruments used by Marine Geologists					
Looking for similarities of borderlines of countries					
Drawing a picture of an ocean floor					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Oceanographer, Physical DOT CODE: 024.061-030

DUTIES: Oceanographers conduct surveys and experiments and then collect and study the data about the motions of ocean water (waves, currents, and tides), marine life (sea plants and animals and their habits), ore and petroleum deposits (minerals and oils contained in the modules and oozes of the ocean floor), and the contour of the ocean (ocean mountains, valleys, and depths). Many of their finds are compiled for maps, charts, graphs, and special reports and manuals.

Many oceanographers work primarily in laboratories on land where they measure, dissect, and photograph fish. They also study sea specimens and plankton. Much of their work entails identifying, cataloging, and analyzing different kinds of sea life and minerals.

Oceanographers use surface ships, aircraft, satellites, and various types of underwater craft to explore and study the ocean. They use specialized instruments to measure and record the findings of their explorations and studies; special cameras equipped with strong lights to photograph marine life and the ocean floor; and sounding devices to measure, map, and locate ocean materials.

WHERE EMPLOYED: Oceanographers are employed by colleges, universities, Federal Government, private industries, and/or fishery laboratories of State and local governments. Although some oceanographers are employed in almost every State, most work in States that border on the ocean.

EMPLOYMENT OUTLOOK:

Persons seeking jobs in oceanography may face competition through the 1980's. Employment of oceanographers is expected to grow about as fast as the average for all occupations as awareness increases of the need for ocean research.

EDUCATION AND TRAINING:

The minimum requirement for beginning professional jobs in oceanography is a bachelor's degree with a major in oceanography, biology, earth or physical sciences, mathematics, or engineering. Students in high school should pursue an academic course including as many of the basic and advanced courses in mathematics and science as they can obtain. In college, a broad program covering the basic sciences with a major in physics, chemistry, biology, or geology is desirable.

Depending on their background and needs, most beginning oceanographers receive on-the-job training.

SPECIAL QUALIFICATIONS:

Aspirants of physical oceanography should have a strong desire to work outdoors and aboard ship. They should be prepared both mentally and physically for the sometimes rigorous demands that will face them. These workers should be well versed in seamanship, marine engineering, mathematics, marine law, navigation, and marine electricity.

EARNINGS AND ADDITIONAL BENEFITS:

Salaries for oceanographers vary according to geographic location, specialty, and employer. Expected salaries range from $10,000 to $26,000 a year.

Oceanographers in educational institutions generally receive the same amount in salaries as other faculty members. In addition to regular salaries, many earn extra income from consulting, lecturing, and/or writing.

WORKING CONDITIONS AND LIFESTYLES:

Oceanographers in shore stations, laboratories, and research centers usually work on a five-day, 40-hour week basis. Research on ocean expeditions requires oceanographers to be away from home for weeks or months at a time. Working and living areas on small research ships are sometimes cramped. Some oceanographers use scuba gear, submersible craft, and other equipment to work under water.

Individuals who like water, who enjoy life aboard ships, and who are willing to absent themselves from home for periods of time may find satisfaction in certain oceanographic positions.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Oceanographer, Physical	024.061-030
Oceanographer, Geological	024.061-018
Oceanographer, Assistant	025.267-010
Stratigrapher	024.061-054

OCCUPATIONAL TASK: Exploring the ocean world

OCCUPATIONAL COMPETENCY: Planning a voyage under water

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Copies of Oceanographers
3. Transparency of Information Sheet A and Information Sheet B
4. Student Attitude Sheet

Optional:

a. Printed copies may be made available for students to use Information Sheets A and B
b. Cassette tapes may be made in advance of all or part(s) of this information

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Appreciate persons employed in oceanography.
2. Become more knowledgeable of the field of oceanography.

LEARNING ACTIVITIES

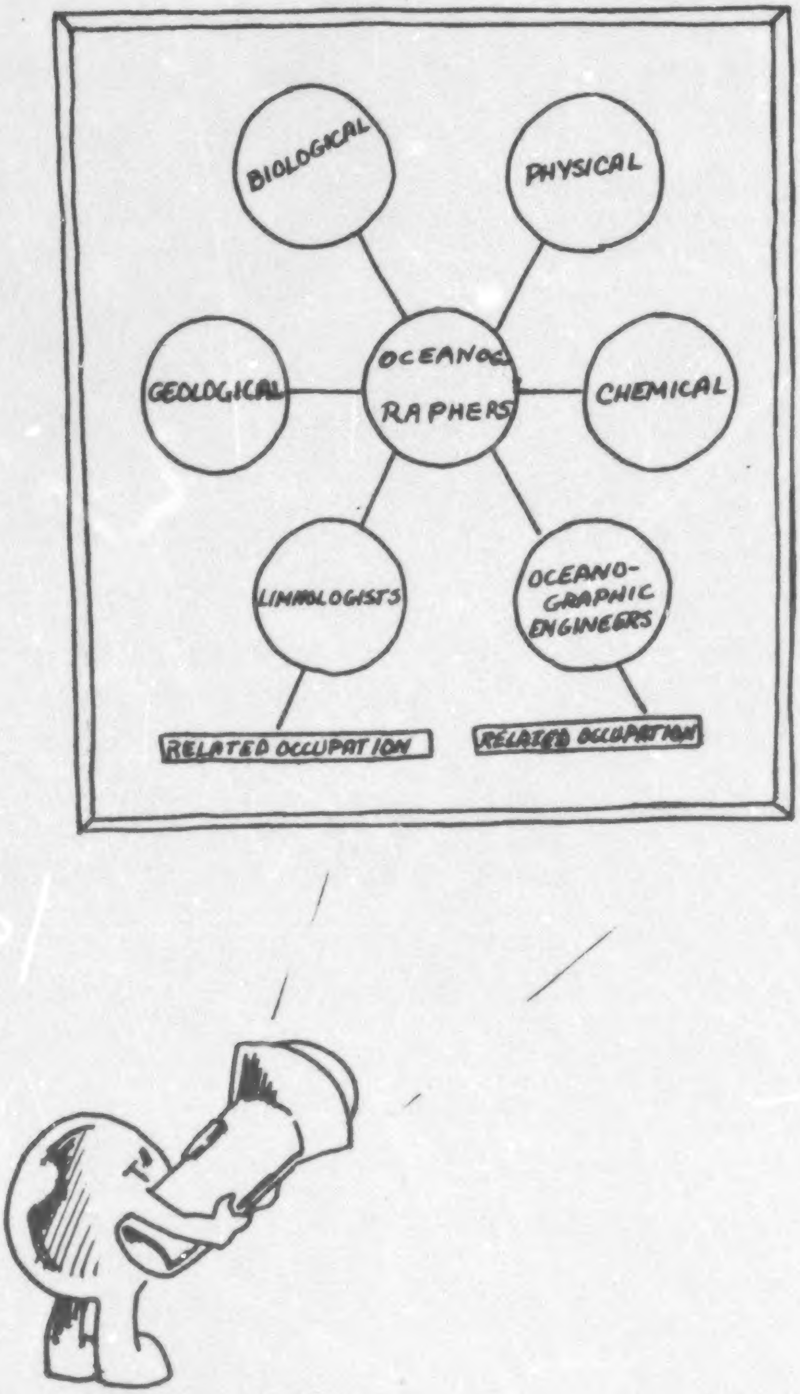
1. Read Career Information Sheet, Oceanographers, Information Sheets A and B.
2. Divide the class into groups so that at least four or five people will be in each group.
3. Plan a five-day voyage on a research ship to study the ocean's floor. Plan for a bathyscaph to be used to go down 1,200 feet to collect information.
4. Complete Activity Sheet: "Voyage to Ocean Floor."
5. Complete Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet, Oceanographers, Information Sheets A and B.
2. Participating in group activity.
3. Completing Activity Sheet: "Voyage to Ocean Floor."
4. Completing Student Attitude Sheet.

FOCUSING ON CAREERS IN OCEANOGRAPHY


BIOLOGICAL
PHYSICAL
GEOLOGICAL
OCEANOGRAPHERS
CHEMICAL
LIMNOLOGISTS
OCEANOGRAPHIC ENGINEERS
RELATED OCCUPATION
RELATED OCCUPATION

Oceanographers

Oceans cover more than two-thirds of the earth's surface and provide people with valuable foods, fossil fuels, and minerals. They also influence the weather, serve as a "highway" for transportation, and offer many kinds of recreation.

Oceanographers' research not only extends basic scientific knowledge, but also helps develop practical methods for forecasting weather, developing fisheries, mining ocean resources, and improving National defense.

Some oceanographers make tests and observations, and conduct experiments from ships or stationary platforms in the sea. They may study and collect data on ocean tides, currents, and other phenomena. Some study undersea mountain ranges and valleys, oceanic interaction with the atmosphere, and layers of sediment on and beneath the ocean floor.

Oceanographers also work in laboratories on land where, for example, they measure, dissect, and photograph fish. They also study exotic sea specimens and plankton (floating microscopic plants and animals). Much of their work entails identifying, cataloguing, and analyzing different kinds of sea life and minerals. At other laboratories, oceanographers plot maps or feed data to computers to test theories about the ocean. For example, they may study and test the theory of continental drift, which states that the continents were once joined together, have drifted apart, and continue to drift apart causing the sea floor to spread. To present the results of their studies, oceanographers prepare charts, tabulations, reports and manuals, and write papers for scientific journals.

Oceanographers explore and study the ocean with low-flying aircraft as well as surface ships. They use specialized instruments to measure and record the findings of their explorations and studies. Special cameras equipped with strong lights photograph marine life and the ocean floor. Sounding devices are vital to the oceanographer for communicating with teammates above the water and for measuring, mapping, and locating ocean materials.

Most oceanographers specialize in one of the following branches of the science.

1. Biological oceanographers
2. Physical oceanographers
3. Geological oceanographers
4. Chemical oceanographers
5. Oceanographic engineers

INFORMATION SHEET A

Job Descriptions of Different Areas Within the Broad Scope of Oceanography

OCEANOGRAPHIC LABORATORY TECHNICIAN

(a) Assists in a variety of chemical and physical tests and analyses such as tide and current studies, water analysis for dissolved gases and minerals, and wave studies.

(b) Maintains cleanliness and orderliness in the laboratory ashore and afloat.

(c) Keeps up the inventory in the laboratory stock.

(d) Calibrates and operates measuring and surveying instruments used in oceanography.

(e) Assists in data acquisition.

(f) Keeps records.

(g) Plots graphs and profiles.

(h) Reduces processed chemical and physical oceanographic station data to a standard format.

HYDROGRAPHIC SURVEY TECHNICIAN

(a) Responsible for operating standard surveying instruments including bottom grabs, sextants, theodolites, various tape-measuring instruments, depth recorders wire drags, and assorted kinds of required navigational equipment.

(b) Reads charts and assists cartographers in the field.

(c) Assists with data acquisition, processing, and in many instances, interpretation and analysis of original data.

DECK SUPPORT TECHNICIAN

(a) Assists deck support party aboard an oceanographic survey vessel.

(b) Rigs various instruments and sampling devices to be used.

(c) Operates various types of oceanographic winches and booms during work week.

(d) Repairs many tools used by oceanographers whenever need occurs.

(e) Crates and labels equipment and samples for shipment to shore installations.

OCEANOGRAPHIC INSTRUMENTATION TECHNICIAN

(a) Determines instrument accuracy.

(b) Modifies equipment.

(c) Designs new auxiliary apparatus.

MARINE ENGINEERING TECHNICIAN

(a) Helps in research and development required in coastal and amphibious engineering.

(b) Assists engineers in the setup of experiments, conduct of experimentations, and theoretical investigations including data reductions, machine computations, and literature of various work.

UNDERWATER TECHNICIAN

(a) Must be a trained qualified diver.

(b) Experienced with commercial diving apparatuses, underwater tools, and safety procedures.

(c) Most useful in oil fields, rigging pipelines and wellheads.

(d) Very useful in testing underwater communications systems, photographic equipment, and underwater closed circuit television.

MARINE PRODUCTS SALESMAN

(a) Searches for new uses for the company's products.

(b) Suggests new products.

(c) Provides technical advice and services.

(d) Keeps abreast of new developments with respect to oceanographic instrumentations.

SCIENTIFIC SUPPORT PARTY CHIEF

(a) Assumes responsibilities of organizing and directing the activities of the deck and associated technicians working aboard scientific research vessels.

(b) Demonstrates knowledge of various instrumentations used by all facilities visiting aboard the vessel.

(c) Knows how to properly store all equipment on the vessel.

(d) Responsible for all incoming and outgoing shipments.

(e) Responsible for making all purchases of inventory as required by visiting scientists.

WATER POLLUTION TECHNICIAN

(a) Works with scientists while determining extent of pollution in rivers, lakes, estuaries, and/or bays.

(b) May participate in surveying questionable geographical areas.

(c) Assists life scientists in conducting ecological studies in suspected or known polluted waters.

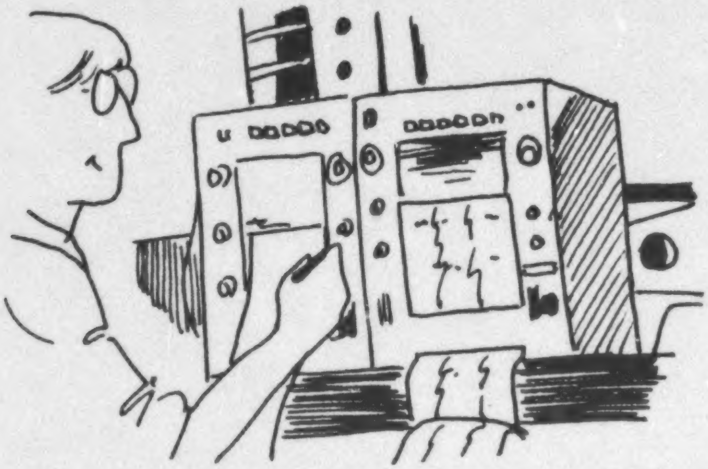
INFORMATION SHEET B

Specializations in Oceanography

Biological Oceanographers (marine biologists) These workers study plant and animal life in the ocean. The biological oceanographers' research has practical applications in improving and controlling commercial and sport fishing and in determining the effects of pollution on marine life.

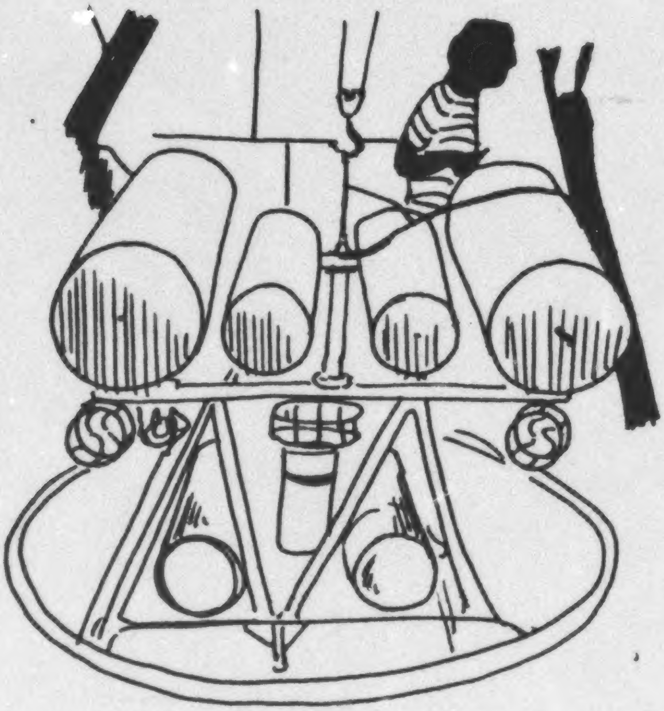
Physical Oceanographers (physicists and geophysicists) Persons employed in this capacity study the physical properties of the ocean such as waves, tides, and currents. Their research on the relationships between the sea and the atmosphere may lead to more accurate prediction of the weather.

Geological Oceanographers (marine geologists) These professionals study the ocean's underwater mountain ranges, rocks, and sediments; some use the knowledge obtained to find valuable minerals, oil, and gas beneath the ocean floor. They study the sedimentary and other rock on the ocean floor and continental shelf.



Chemical Oceanographers investigate the chemical composition of ocean water and sediments as well as chemical reactions in the sea.

Oceanographic Engineers design and build instruments for oceanographic research and operations. They also lay cables and supervise underwater construction.



ACTIVITY SHEET

"Voyage to Ocean Floor"

Someone has defined an oceanographer as a research scientist who does not get too seasick to do his/her job. One of the duties of the physical oceanographer is to monitor the water in the ocean.

Plan a five-day voyage to the ocean floor. Using Information Sheets A and B, choose the people that will accompany a physical oceanographer on this voyage. In your plan, develop charts for recording information such as depth, pressure, temperature, salinity, density, and velocity.

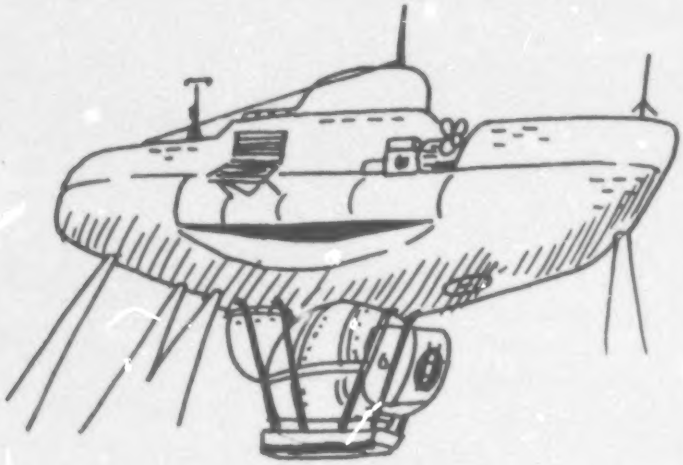
A number of instruments will have to be placed in a pattern on the ocean bottom. Some instruments are capable of producing readings of salinity, temperature, density, and/or velocity. List some of these instruments. Perhaps a science teacher can offer suggestions.

Once you have returned to the research ship from the bathyscaph you can play the recordings which were made on cassette tapes placed in the instruments on the ocean floor. Be sure to include computers, oscilloscopes, counters, amplifiers, and any other instruments needed for this exciting voyage.

BATHYSCAPH

(Scientific Submarine)

In planning your five-day voyage to the ocean floor, you will be housed in a Bathyscaph. It is important for you to know that this vehicle has the capability of descending more than 30,000 feet into the ocean. Many physical oceanographers use Bathyscaphs as a means of transportation to study the ocean's physical features, temperature, pressure, tides, and currents.

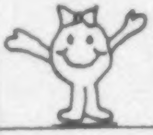


Name ______________________________

Occupational Cluster Marine/Fresh Water - Oceanographer, Physical

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading about oceanography					
Planning a voyage to study the ocean's floor					
Participating in group activities					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Surveyor, Marine

DOT CODE: 018.167-046

DUTIES:

A person employed as a marine surveyor makes surveys of harbors, rivers, and other bodies of water to determine shore lines, topography of bottom, or other items for such purposes as determining navigable channels, and securing data for construction of breakwaters, piers, and other marine structures.

The marine surveyor charts the rocks, reefs, shoals, lights, and buoys, and the height and times of tides and water stages. In addition, s/he may estimate the yardage of silt for dredging projects, determine the volume of impounded water, or determine drainage areas for use in planning and controlling engineering projects such as dams, reservoirs, tunnels, bridges, docks, and other river and harbor improvements.

WHERE EMPLOYED:

Persons aspiring to work as marine surveyors may choose to apply at the U.S. Geological Survey, the National Oceanic and Atmosphere Administration, the Army Map Service, and the Naval Oceanographic Office, as well as at private companies.

EMPLOYMENT OUTLOOK:

The employment outlook for marine surveyor is very good. These workers will always be needed because navigation charts are necessary for safe water travel. Personnel are needed each year to fill the positions of those who are promoted, transfer to other jobs, retire, or die.

EDUCATION AND TRAINING:

A minimum of a bachelor's degree in engineering with emphasis on hydrology is required for entry into the field. The engineer must acquire experience on the job before s/he is considered ready to accept the responsibility of large surveys.

The marine surveyor must continue to study in order to stay abreast of new developments.

All fifty states require licensure or registration of surveyors.

SPECIAL QUALIFICATIONS:

Aspirants of this type of work should have a strong liking for outdoor work. Sound health, good eyesight, leadership ability and a pleasing personality are very important to this occupation. The employee should also be able to make careful notes and strive for absolute precision in the various aspects of work.

EARNINGS AND ADDITIONAL BENEFITS:

Salaries paid to marine surveyors vary widely depending primarily on the nature of tasks involved, experience, and his/her educational background. These workers' salaries range from $8,000 to $17,000 annually depending upon the amount of education. Bonuses are often earned by people who are stationed to work outside the United States.

WORKING CONDITIONS AND LIFESTYLES:

The work schedule for a marine surveyor is varied. Part of the work is completed in an office setting which is usually well lighted and comfortable. This work may consist of consulting charts, maps, drawings, and data collected on field trips. Another part of the required work may be completed in open, exposed, varied weather conditions near the seaside or aboard ship.

Some work may require an employee to spend considerable time away from home base, at times, in primitive surroundings.

Because of the professional status, the marine surveyor usually gets to set his/her own working hours. Most employees keep a regular forty-hour week schedule. Occasionally, emergencies demand that additional hours of work are needed in order for completion of the project. Sometimes these employees are required to check on operations or a project even on a day off and after hours.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

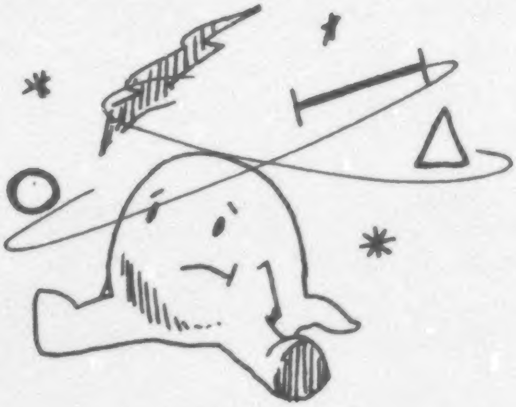
OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Surveyor, Marine	018.167-046
Surveyor, Geophysical Prospecting	018.167-042
Supervisor, Mapping	018.167-030

OCCUPATIONAL TASK: Mapping the topography along the shoreline of a body of water

OCCUPATIONAL COMPETENCY: Using symbols for charting



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A
3. Activity Sheet B
4. Student Attitude Sheets

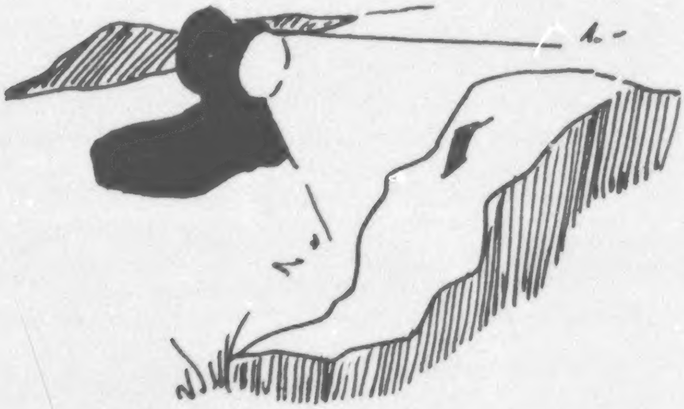
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better understand the contributions made by marine surveyors.
2. Become more knowledgeable of symbols used in mapping the topography along a shoreline of a body of water.
3. Determine if you want to learn more about this type of work.

LEARNING ACTIVITIES

1. Become familiar with information on the Career Information Sheet.
2. Review the symbols and abbreviations on Activity Sheet A.
3. Complete Activity Sheet B.
4. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with information pertaining to marine surveyor.
2. Reviewing symbols and abbreviations on Activity Sheet A.
3. Completing and submitting Activity Sheet B to the teacher.
4. Completing the Student Attitude Sheet.

ACTIVITY SHEET A

SYMBOLS

A marine surveyor is responsible for identifying rock, shoal, depth, sounding, bank, channel, bay, and harbor details for the safe landing of a ship and its crew.

Below are listed some symbols and abbreviations which have been placed on maps to represent the findings along the shoreline by marine surveyors.

BUOYS

T B	Temporary Buoy
C	Can
R	Red
Or	Orange
W	White
G	Green
N	Nun
S	Spar
Y	Yellow
B	Black

LIGHTS

F	Fixed
FL	Flashing
Qk	Quick
ALT	Alternating
Gp	Group

BOTTOM CHARACTERISTICS

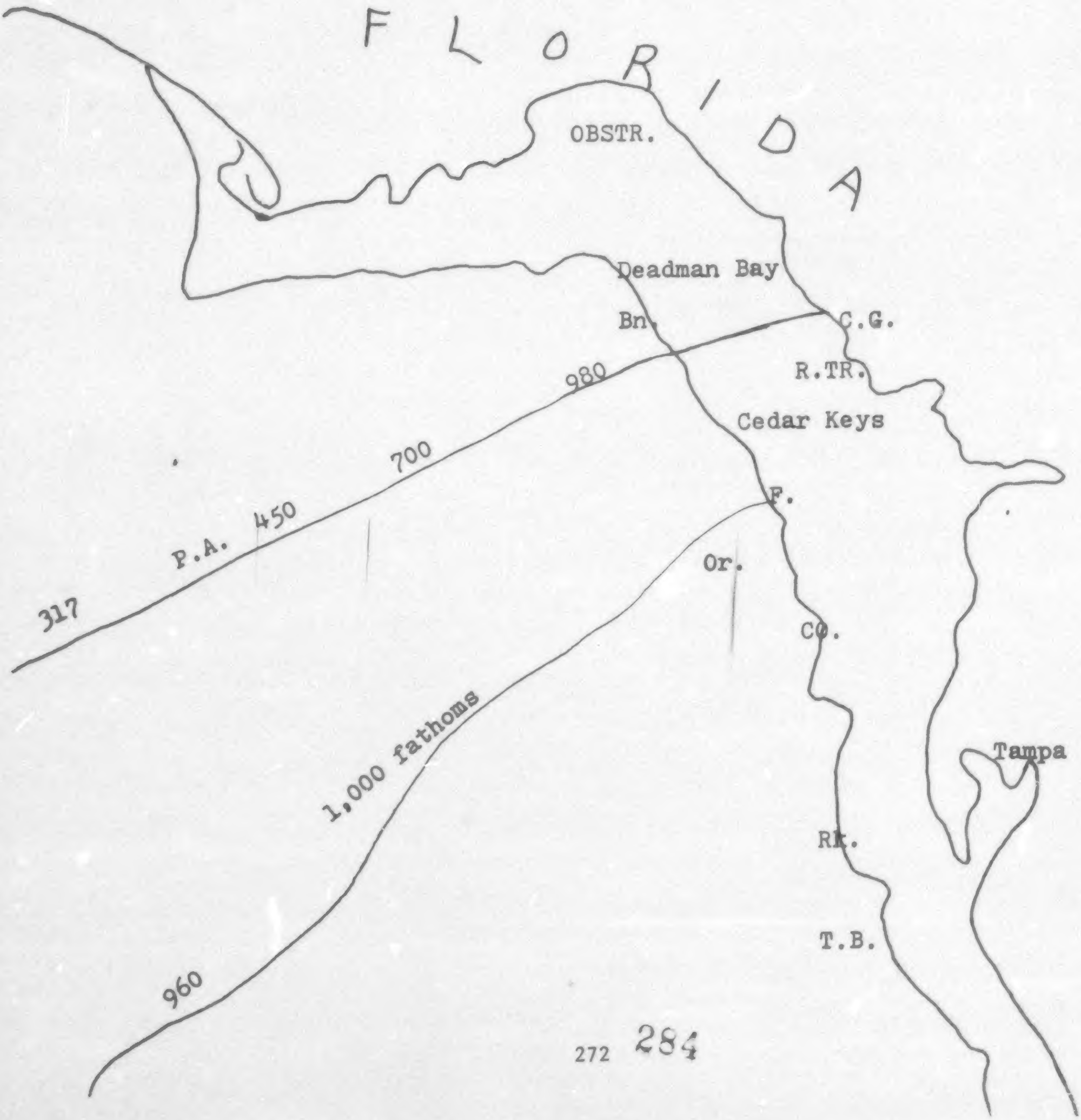
CL.	Clay
CO.	Coral
G.	Gravel
GRS.	Grass
M.	Mud
Rk.	Rock
S.	Sand
Sh.	Shells
Hrd.	Hard
Rky.	Rocky
Sft.	Soft
Stk.	Sticky

OTHER

P.A.	Position Approximate
E.D.	Existence Doubtful
OBSTR.	Obstruction
Bn.	Daybeacon
R.TR.	Radio Tower
C.G.	Coast Guard Station

Activity Sheet B

Using Activity Sheet A, identify the symbols, abbreviations, and bottom characteristics indicated below. Starting at the bottom of the page and moving upward to the end of the map, you should be able to identify 10 items which would be concerns to a marine surveyor.


FLORIDA
OBSTR.
Deadman Bay
Bn.
C.G.
R.TR.
980
Cedar Keys
700
F.
450
P.A.
Or.
317
Co.
1,000 fathoms
Tampa
Rk.
T.B.
960

ACTIVITY SHEET B

KEY

1. Temporary buoy
2. Rock
3. Coral
4. Orange buoy
5. Fixed light
6. Radio Tower
7. Coast Guard Station
8. Daybeacon
9. Obstruction
10. Position Approximate

Name ____________________

Occupational Cluster Marine/Fresh Water - Surveyor, Marine

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with Career Information Sheet					
Reviewing symbols and abbreviations					
Identifying symbols and abbreviations on a map					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Underwater Archeologist DOT CODE: 055.067-018

DUTIES:

An underwater archeologist's duties include bringing up artifacts or other evidence of civilization from the sea, classifying the evidence as to age and culture, and studying the history of the area where evidence has been located.

Upon locating the exact spot to investigate, the worker measures the area and draws a sketch of the scene. Sometimes s/he may use an underwater camera to take pictures of the project. If the project is covered too thickly with mud, the underwater archeologist plans a systematic cleaning of the site using large air hoses. Depending upon the size of the objects to be collected and transported to the deck of his/her ship, the archeologist uses a basket for smaller objects and a rope tied securely around larger objects.

After an expedition returns to the base headquarters, the underwater archeologist directs the packing and shipping of the artifacts that have been found. S/He may write several reports describing the expedition and making a detailed map of the location of the site. The underwater archeologist is concerned primarily with putting together the pieces of evidence discovered in order to obtain information about a past culture or civilization.

WHERE EMPLOYED:

Persons qualified to work as underwater archeologists should make applications at museums, research foundations, colleges and universities, federal government through civil service, and/or private companies who employ underwater archeologists.

EMPLOYMENT OUTLOOK: The employment outlook for underwater archeologists is expected to be favorable for many years. Competition may be keen; however, there appears to be opportunities for growth in the nautical specialty.

EDUCATION AND TRAINING: A master's degree complemented with field experience is required for entry into many beginning professional positions.

Courses in archeology, geology, mineralogy, oceanography, physics, and zoology are helpful to workers in this type of work.

SPECIAL QUALIFICATIONS: Aspirants must have excellent health to cope with the rigorous and strenuous work of swimming and diving. Good eyesight and stamina are necessary.

Ability to work well with people from all levels of society and from many different countries is important.

EARNINGS AND ADDITIONAL BENEFITS: Salaries for underwater archeologists range from $10,000 - $30,000 a year depending upon the amount of education and experience.

These workers may expect fringe benefits, such as hospitalization, insurance, and vacations depending upon individual employers. If the archeologists become employed by the federal government, they can expect the usual fringe benefits given to most civil service employees, such as vacations with pay, hospitalization, annual sick leave, and a plan for retirement.

WORKING CONDITIONS AND LIFESTYLES:

The underwater archeologist usually works in deep water and/or on a ship. Before diving in deep water, a scuba is strapped to his/her back over a wet or dry suit. Rubber fins are worn on the feet and a watertight glass mask covers the eyes and nose.

Most expeditions are conducted during the summer and early fall months because of the more favorable weather conditions. An archeologist may have to live aboard a ship for weeks at a time. The work is usually completed by a crew of divers and seldom does one worker dive alone.

There are no set hours of work because the job is of a seasonal nature. Under favorable weather conditions, underwater archeologists may make as many as two or three dives in one day. Sometimes these workers may have to work late into the night in order to finish the work before a storm approaches the area.

These workers sometimes experience seasickness when the sea is rough. Discouragement may be felt by underwater archeologists when an expedition meets with failure because of adverse weather or faulty mechanical equipment.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

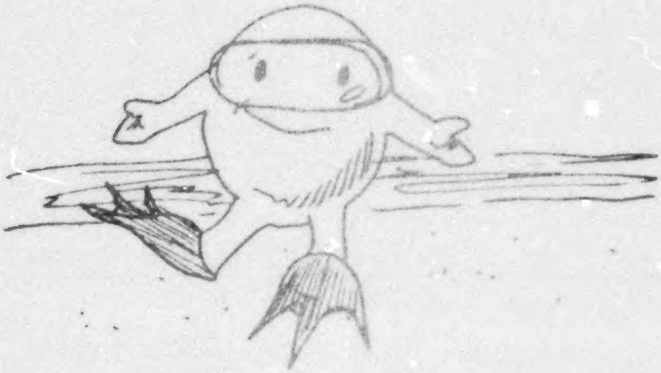
OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Underwater Archeologist	055.067-018
Conservator, Artifacts	055.381-010
Oceanographer, Physical	024.061-030

OCCUPATIONAL TASK: Becoming an underwater archeologist

OCCUPATIONAL COMPETENCY: Planning worthwhile leisure-time activities now for tomorrow



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Transparencies of "Adventurous Men of the Ocean Era" and "Do You Dare To Go Somewhere Different?"
3. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize the importance of planned leisure-time activities.
2. Better understand the field of archeology.
3. Determine if you desire to learn more about an underwater archeologist.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet printed material. The teacher may record the information on a cassette tape, plan a panel discussion, or make individual copies for students.
2. Compile a list of leisure-time activities which may help you to develop the various special qualifications needed by an underwater archeologist.
3. Listen attentively to a carefully selected three-member panel discussing archeology.
4. Read "Adventurous Men of the Ocean Era" and "Do You Dare To Go Somewhere Different?" Teacher may choose to put this information on a transparency.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Compiling a list of leisure-time activities.
3. Participating and/or listening attentively to a panel discuss archeology.
4. Reading articles listed in Number 4 under Learning Activities.
5. Completing the Student Attitude Sheet.

Key

LEISURE TIME ACTIVITIES TO ENHANCE UNDERWATER ARCHEOLOGY

College-preparatory subjects important for aspirants of underwater archeology include:

a. Mathematics

b. Physics

c. Chemistry

d. Biology

e. Foreign Languages

    1. Latin

    2. Spanish

    3. French

    4. Greek

    5. Russian

In addition to these courses during high school, students should get involved in leisure-time activities. Other areas of study essential to the underwater scientist include:

a. Physical Fitness Programs

    1. Swimming

    2. Tennis

    3. Acrobatics

    4. Track

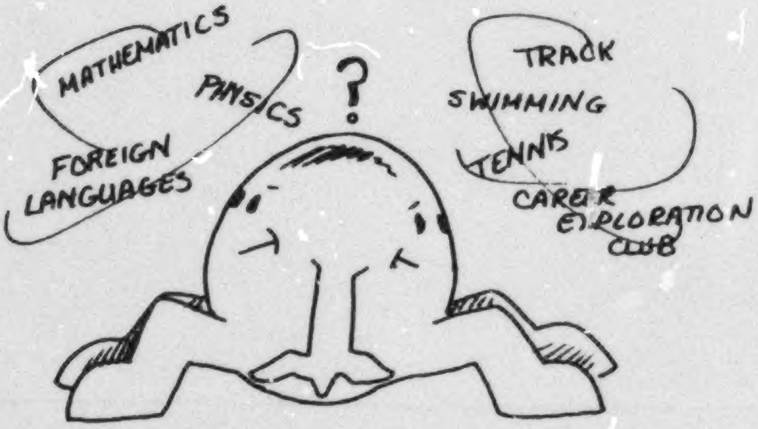
b. Drafting

    1. Mechanical Art

    2. Sketching

c. Clubs
    1. Local YMCA or YWCA
    2. School Swimming Club
    3. Local Skin Diving Club
    4. Career Exploration Club
    5. High School Vocational Youth Organizations

d. Part-Time Work
    1. Local Underwater Salvage Company
    2. Museum or University


MATHEMATICS
PHYSICS
FOREIGN LANGUAGES
?
TRACK
SWIMMING
TENNIS
CAREER EXPLORATION CLUB

Panel Information
Speaker I

THE TASK OF UNDERWATER ARCHEOLOGY

First of all, a permit is required from the country bordering the waters in which the sea-dig is performed. In some instances, the countries that grant the excavating permits retain ownership of the artifacts.

The underwater archeologist has two jobs: to find and recover things, and to figure out what the things mean. The objects s/he looks for underwater may be the remains of religious shrines, shipwrecks, and/or submerged towns or cities. They may also be small, movable objects, such as tools, weapons, household utensils, or ornaments.

The name artifact is often assigned to the objects studied by the archeologist. This name comes from the Latin words artis (art) and factus (made). It simply means that an object was made by art or skill rather than by nature.

If a chunk of stone has been chipped to a sharp edge so that it can be used as an ax, it is an artifact. The rock beside it may have been used a thousand times to crack something open, but no one can tell this by looking at the rock. Therefore, it is classified as a natural object and not an artifact.

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Panel Information
Speaker II

GATHERING UNDERWATER ARCHEOLOGICAL MATERIALS

The underwater archeologist may have to depend upon historical events and/or current events to help him/her determine a location where valuable objects may be found. The archeologist has to become very familiar with the history of the area and learn as much as possible about the sea and the types of ships that sailed in the area.

While in the water, this worker wears scuba gear. After the boat is anchored, s/he puts on a rubber dry or wet suit and the scuba gear, then dives. The anchor rope is the guide to the site of the dig. After locating the underwater site, this worker measures the area and either draws a sketch of the scene or takes pictures. After studying the sketches and pictures, the underwater archeologist can better determine whether the materials indicate a shipwreck or a submerged coastal village.

Wire baskets are used to place smaller objects in for transporting to the ship while ropes are used for larger objects. After the objects are on board the ship, the trained archeologist carefully scrapes away the coral accumulation. Once the artifact is clean, it is compared to objects found in land excavations. Much time may have to be spent in libraries and/or museums in order to make proper identification.

Panel Information
Speaker III

INTERPRETING THE MATERIALS GATHERED FROM UNDER THE WATER

Special care must be taken in removing objects which are to be studied and interpreted by archeologists.

Stratigraphy means keeping track of the layers in which specimens are found. The method must be used carefully, however, because layers often get mixed up through the years.

One way of determining the age of an ancient building or parts of a shipwreck is to examine bits of broken items which are found on the site of nearly every ruin.

A three-ring method is used to discover the age of buildings by figuring out when the wood used in it must have been cut. Today, it is possible to date an ancient cliff dwelling almost exactly from a single piece of wood in it.

Another more recent and accurate method for interpreting archeological findings makes use of atomic energy. All living things contain a certain amount of a radioactive kind of carbon called Carbon 14. But when they die, no more Carbon 14 is taken in, and the supply already there decays. In doing so it gives off beta particles which are electrons. Scientists can measure the number of beta particles given off per minute from a sample of a definite size and thus determine its age. For example, in a pure sample, half the radioactivity will be left after about 5,900 years. Material 30,000 years old can be measured by this method. This method helps archeologists to better determine the actual age of materials.

Adventurous Men of the Ocean Era

Most of the underwater canyons, trenches, valleys, mountains, and plains remain a territory yet to be explored by mankind.

Below are names of people who have demonstrated an interest in that part of our world, the sea, yet to be explored.

1. George F. Bass and Peter Throckmorton work as underwater archeologists.

2. Dr. William Beebe was the first naturalist to enter the abyss.

3. Jacquese Yves Cousteau is the intrepid French pioneer of the Aqua-Lung.

4. Dr. Harold E. Edgerton has developed deep-sea cameras and an electronic flash.

5. Edwin A. Link is an undersea explorer.

6. Leonardo da Vinci invented a version of the hand and foot fins.

7. Benjamin Franklin also made foot fins. However, in 1933, a Frenchman named Louis de Corlieu patented the present-day type.

8. Sir Edmund Halley in 1691 invented the diving bell. The present-day version of the diving bell is a large tank into which the correct amount of air is pumped.

9. Elias Stadiatis and Captain Demetrios Kondos in 1900 performed the first underwater excavation which was supervised by archeologists. The excavation site is known as Antikythera. Masterpieces of Greek sculpture in bronze and marble were obtained.

Do You Dare To Go Somewhere Different?

The literature reveals that our vast undersea world covers more than 139 million square miles and contains superlative geography. Below is information pertaining to unusual places.

A. Mid-Oceanic Ridge is the earth's longest mountain range which meanders between the continental land masses for 40,000 miles through all the oceans. Rising 6,000 to 12,000 feet above the bottom, the pinnacles of the ridge occasionally break through the surface to form islands, such as the Azores and Ascension.

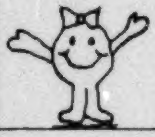
B. Mariana Trench reaches the earth's greatest known depth, nearly seven miles below the surface of the sea. This is earth's deepest known chasm. It is believed to be approximately 35,800 feet deep. Mariana Trench, the ocean's greatest abyss, is located in the Western Pacific.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Underwater Archeologist

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with underwater archeologist's duties					
Compiling a list of leisure-time activities helpful to becoming an underwater archeologist					
Panel discussion of underwater archeologists					
Additional information pertaining to contributions and unusual places					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____

____

____

CAREER INFORMATION SHEET

JOB TITLE: Underwater Photographer DOT CODE: 143.457-010

DUTIES:	An underwater photographer takes pictures of strange creatures and seascapes which previously could only be seen by deep-sea divers. This worker takes his/her special camera equipment to the depths and takes photographs that marine scientists can then study on the surface. The underwater photographer must know the proper kinds of film, the correct shutter speeds, the amount of illumination, and the necessary time exposure for each picture. After taking the pictures, the underwater photographer develops and prints them, usually making enlargements so that scientists can study them with ease. While taking pictures underwater, the photographers use artificial breathing equipment. Oxygen is pumped to them through air hoses. These photographers can move from the ship only to the extent of their air hoses.
WHERE EMPLOYED:	Underwater photographers are employed to assist oceanographic research teams. Some of these workers are employed by schools and various foundations involved in scientific research studies. Still others may work freelance, taking pictures to sell to advertisers, magazines, and other customers.
EMPLOYMENT OUTLOOK:	The employment outlook is expected to be very good through the 1980's. In addition to openings resulting from increased demand for underwater photographers, others will occur as workers die, retire, or transfer to

other occupations.

Researchers are working long hours to complete their studies to learn the extent to which the sea's resources can be used. Photography is an important part of this research, and as research continues to expand along with the field of photography, the future seems bright with respect to employment opportunities for talented and well-trained underwater camera operators.

EDUCATION AND TRAINING: At least a high school education is highly recommended. Employers usually seek applicants who have a broad technical understanding of photography. Technical expertise can be obtained through practical experience, post-secondary training, or some combination of the two. Some jobs do require that applicants specialize in areas outside of photography.

Interested persons may earn a bachelor's degree in photography; more than 100 colleges and/or universities offer this training. Courses may be taken in photography by students in college while majoring in oceanography or other science related to it. Many trade schools offer courses which teach basic photographic skills.

In addition to photography knowledge, these workers must be properly trained to do underwater work. Some colleges offer physical education classes in scuba diving. Also, YMCA's sometimes give this instruction.

SPECIAL QUALIFICATIONS: Endurance and good physical condition are essential. This worker must be a professional photographer and a competent deep-sea diver.

S/He must work with accuracy and meticulous skill, as there may be no chance to retake pictures which do not turn out.

EARNINGS AND ADDITIONAL BENEFITS:

The earnings and fringe benefits for underwater photographers will vary depending upon various employers. An expected range of salary for professional photographers with some engineering or scientific training is $9,000 to $10,000 a year.

These workers usually receive additional benefits such as vacations and sick leave days with pay. In addition to this, they often have excellent opportunities to further their educations.

WORKING CONDITIONS AND LIFESTYLES:

Underwater photographers operate from ships most of the time. In some cases, an expedition team has to live on a ship for the duration of the trip. The living conditions on board ship may be cramped and somewhat uncomfortable.

When working underwater, the camera operator is subject to the same hazards all divers face. Some sea creatures are dangerous; divers must work with caution. These divers may carry weapons for protection.

The underwater photographer may have to work irregular hours. Travel, weather conditions, mechanical operations, and the absence-or presence-of aquatic life are all factors in determining these employed persons working hours. The assignments have to be completed regardless of the number of hours required.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Research

REPRESENTATIVE JOB TITLES:

Underwater Photographer	143.457-010
Scuba Diver	379.384-010
Oceanographer, Physical	024.061-030

OCCUPATIONAL TASK: Conducting underwater photography

OCCUPATIONAL COMPETENCY: Capturing on film the exciting world of marine/fresh water life

RESOURCES and/or MATERIALS

1. Career Information Sheet(s)
2. Camera with film
3. Magazines: National Geographic, Field and Stream, etc.
4. Student Attitude Sheet.

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize more that photographic skills aide scientific studies.
2. Discuss the responsibilities of an underwater photographer.
3. Determine if you want to continue to learn about underwater photography.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet material.
2. Make a photograph of fish in an aquarium.
3. Collect pictures of underwater scenes to construct a bulletin board or scrap book on marine life.
4. Write an article for a magazine describing the experiences encountered in an underwater exploration.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Participation in classroom activities.
3. Completing the Student Attitude Sheet.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Underwater Photographer

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with underwater photographers					
Collecting pictures of underwater scenes					
Writing an article for a magazine with respect to an underwater exploration					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Customs Inspector DOT CODE: 168.267-022

DUTIES:

The primary duty of a customs inspector is to inspect and supervise incoming and/or outgoing passenger and cargo vessels and report any violations of revenue, navigation, commerce, or neutrality laws to the customs collector. S/He may examine and search the luggage of passengers who arrive in American ports of entry by ship from a foreign country. A ship stops at an inspection port, and the passengers open their baggage and present their declaration forms to the inspector. At that time, the customs inspector verifies each passenger's identity and signature. The traveler is questioned whether or not s/he is a resident of the United States and checking the answer against the declaration form.

Sometimes the inspector examines the baggage to determine the amounts of dutiable goods being brought into the country and to prevent smuggling of dutiable or prohibited goods.

The boarding inspector goes onto ships that come to American ports before they dock but after they have passed quarantine inspection. Forms are completed with respect to name, class, and nationality and stating the port of origin of the cargo being carried. After inspecting the cargo and comparing it to the invoice, this worker certifies the invoice.

Other duties include verifying the passenger and crew lists and securing and sealing the hatches of the ship until the captain obtains a permit to unload. The customs guard maintains a close watch over all merchandise on a pier or on board a ship that is under the custody of customs officials. It is imperative that security measures be taken to insure that customs regulations are met or to prevent entry if this merchandise would be against the law. S/He stops and searches all persons or vehicles leaving the pier or vessel and opens and examines any packages these persons may be carrying.

WHERE EMPLOYED: This employee may work at a border station on either the Canadian-American or Mexican-American border or at a seaport or river port.

EMPLOYMENT OUTLOOK: The employment outlook is expected to be moderately fair in the future. Some new employees may be needed every year to replace those who leave for other work, retire, or die.

EDUCATION AND TRAINING: Aspirants for customs inspector positions should have at least a high school education. In addition to this, s/he must also have four years of experience in a job whereby problems were solved or an alternate of three years of college or university work. The examination administered for this position is the standard investigator's test, and it involves many types of questions.

SPECIAL QUALIFICATIONS: The minimum age for this work is twenty-one years. A customs inspector usually carries a gun, and must be able to handle it well. S/He needs an extremely retentive mind and excellent perception.

EARNINGS AND ADDITIONAL BENEFITS: A customs inspector works under the civil service system and the salary depends upon his/her classification.

Salary ranges are from $10,500 to $25,000 a year. In addition to the pay, additional benefits include vacations with pay, yearly merit and cost-of-living raises, and regular paid holidays. These inspectors can expect the government to give a clothing allowance for uniforms.

WORKING CONDITIONS AND LIFESTYLES:

A customs inspector usually works forty hours a week. S/He works five days a week. Because these workers must be on duty at all times, they are required to work some weekends and/or holidays.

Inspectors who work on a pier or dock of a seaport or river port are outside part of the time. They board all types of ships and sometimes encounter difficulties or trying working conditions.

Most customs sheds on piers are well-kept and fairly modern. Paperwork must be completed by an inspector in addition to the regular inspection duties.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

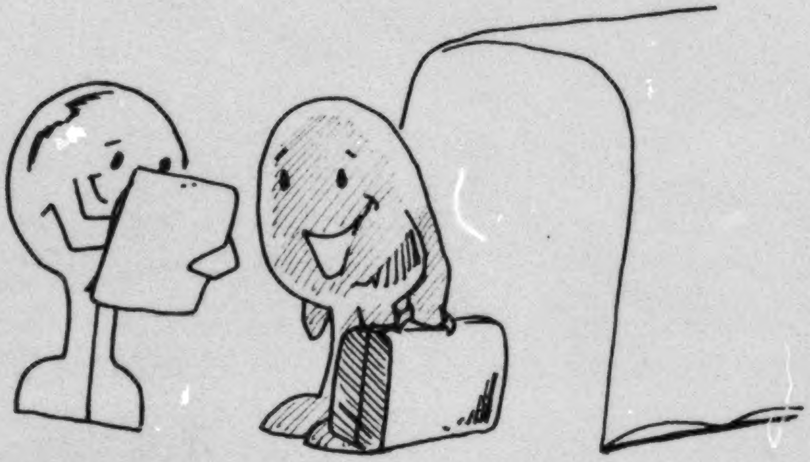
Customs Inspector	168.267-022
Customs Import Specialist	168.267-018
Customs Examiner	168.267-018

OCCUPATIONAL TASK: Becoming familiar with a customs inspector's position

OCCUPATIONAL COMPETENCY: Determining advantages and disadvantages

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Suitcase
3. Various items of clothing
4. Student Attitude Sheets



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize that customs inspectors perform a vital and useful service to the United States.
2. Recognize attractive features associated with a customs inspector's position.
3. Discuss advantages/disadvantages of becoming a customs inspector.

LEARNING ACTIVITIES

1. Become familiar with customs inspector Career Information Sheet material.
2. Assemble several pieces of clothing and other personal items into a suitcase.
3. Role play a situation where luggage is being checked by a customs inspector. Allow for some items not to pass inspection.
4. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Participating in assembling various items into a suitcase.
3. Role playing a scene of a customs inspector refusing to allow some items to enter the United States.
4. Completing and submitting the completed Student Attitude Sheet to the teacher.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Customs Inspector

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with customs inspector information					
Role playing luggage being checked and refusal of items to enter the United States					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Lock Operator DOT CODE: 911.362-010

DUTIES:

The lock operator controls machinery to open and close locks and dams on canals. S/He observes gages and turns valves to increase or decrease water levels in locks.

Among the other duties of the lock operator can be found observing positions of vessels and tying-up mooring lines in lock, starting motors to open gates and sections of dams for passage of vessels, turning on navigation lights and traffic signals along the canal, and cleaning, oiling, and making minor repairs to equipment.

S/He collects lock slips (vessel identification slips) from vessel operators and submits them to his/her supervisor. Sometimes, this employee is responsible for directing the activities of other workers engaged in mooring vessels in lock.

WHERE EMPLOYED:

Persons aspiring to work as lock operators should seek employment by getting their name on a lock and dam register at a regional office. Possible places for employment include working on rivers, lakes, and/or canals where locks and dams are located.

EMPLOYMENT OUTLOOK:

Because of automated equipment and facilities, employment opportunities for lock operators are expected to decrease during this decade. However, opportunities for employment are expected to result from people planning to retire, changing places of employment, or simply dying.

EDUCATION AND TRAINING: It is highly recommended that aspirants obtain at least a high school education. Courses in high school which may prove helpful to these workers include mechanics, hydraulics, electricity, carpentry, masonry, and mathematics. At the present time, the use of computers is being implemented at the locks and should be mastered by high school students.

SPECIAL QUALIFICATIONS: Each new employee must pass a physical examination which has been administered by a designated physician. Employees must be at least 18 years of age. They must be able to handle lines effectively and have acquired experience prior to their coming to work as lock operators such as having served in the U.S. Navy. Lastly, these employees must be able to communicate with boat employees effectively using radios and/or telephones.

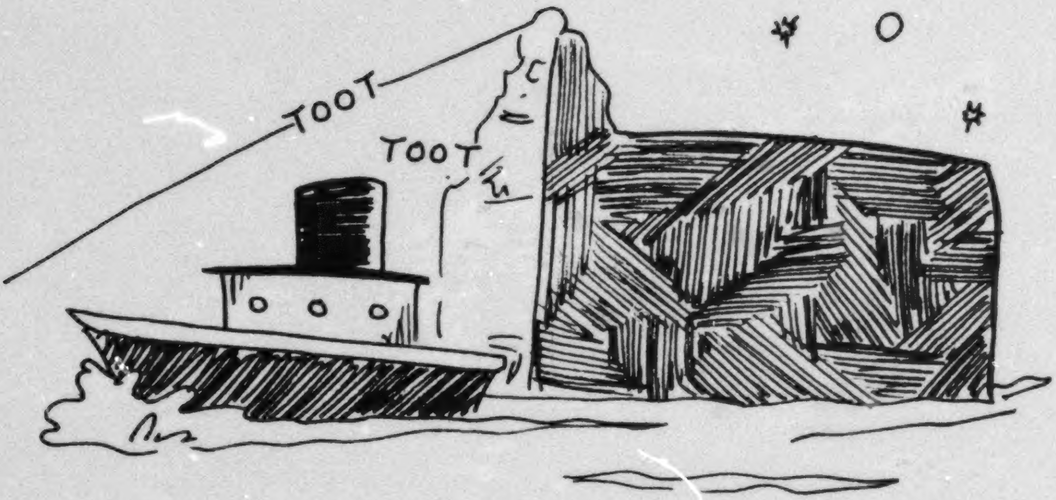
EARNINGS AND ADDITIONAL BENEFITS: These employees can expect to receive an hourly wage of about $5.00 Some places require that their new employees work a probation period of one year. Increases are paid to employees according to experience and performance.

Time-and-one-half is paid to employees for all hours which exceed 40 hours a week. Double pay is paid to all workers who are required to work on special holidays.

Fringe benefits include some holidays off from work with pay, vacations with pay, sick leave with pay, and some type of health insurance.

WORKING CONDITIONS AND LIFESTYLES: Most employees work 40 hours a week which involves an eight-hour shift. Lock operators must work out-of-doors approximately 90% of the time regardless of the weather conditions.

Whenever they do work indoors, the work station is rather small with a lot of glass for visibility purposes. It is usually difficult to stay warm during colder temperatures.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

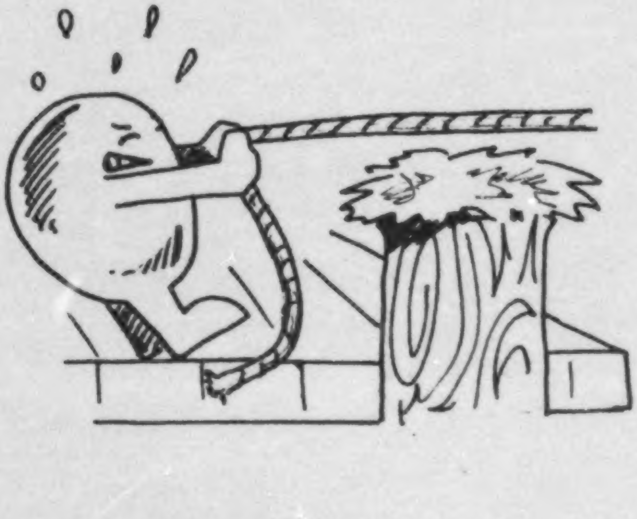
Lock Operator	911.362-010
Ferryboat Operator	911.363-010
Quartermaster	911.363-014
Stevedoring Superintendent	911.137-022

OCCUPATIONAL TASK: Examining the work of a lock operator

OCCUPATIONAL COMPETENCY: Differentiating between lockage types

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A
3. Word Search Puzzle
4. Student Attitude Sheet



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of a lock operator's responsibilities.
2. Appreciate terminology used by lock operators.
3. Better understand types of lockage being completed by locks and dams.

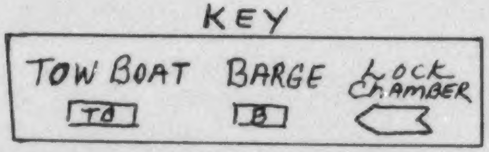
LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Review Information Sheet A.
3. Complete the Word Search Puzzle.
4. Complete the Student Attitude Sheet.

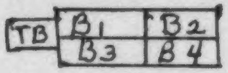
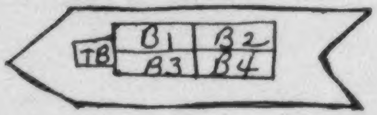
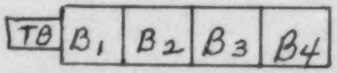
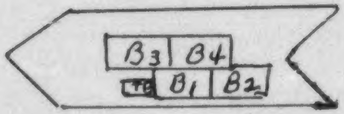
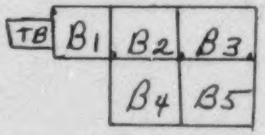
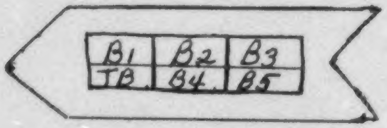
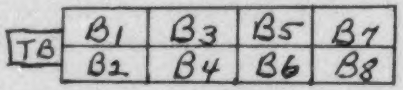
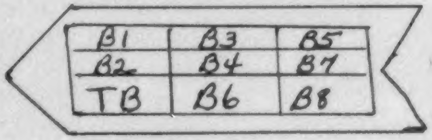
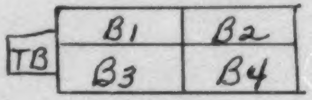
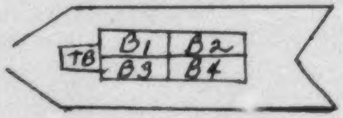
EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Reviewing Information Sheet A.
3. Completing the Word Search Puzzle.
4. Completing the Student Attitude Sheet.


KEY
TOW BOAT
TB
BARGE
B
LOCK CHAMBER

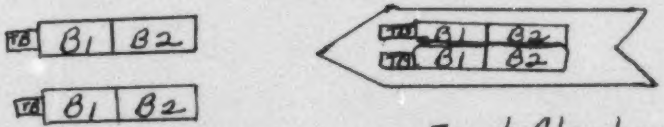
INFORMATION SHEET A
TYPES OF LOCKAGE

DESCRIPTION	TOW PRIOR TO ENTERING CHAMBER	TOW IN LOCK CHAMBER
1. "Straight" lockage - the cut is not broken up for lockage.	 TB B1 B2 B3 B4	 TB B1 B2 B3 B4
2. Setover - the towboat and one or more of its barges are separated as a unit from the remaining barges to be "set over" for service.	 TB B1 B2 B3 B4	 B3 B4 TB B1 B2
3. Knockout - the towboat alone is separated from its barges to be "set over" for service.	 TB B1 B2 B3 B4 B5	 B1 B2 B3 TB B4 B5
4. Jackknife - the tow is rearranged, usually from two barges wide to three by breaking the face coupling on at least one barge and knockout of the tow.	 TB B1 B3 B5 B7 B2 B4 B6 B8	 B1 B3 B5 B2 B4 B7 TB B6 B8
5. Open Pass - the vessel traverses the lock with no lock hardware operation. This may occur at tidal locks and other facilities.	 TB B1 B2 B3 B4	 TB B1 B2 B3 B4

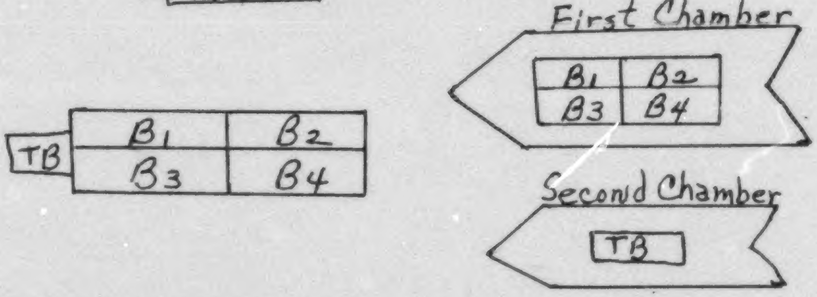
INFORMATION SHEET A (cont'd)
TYPES OF LOCKAGE

DESCRIPTION — TOW PRIOR TO ENTERING CHAMBER — TOW IN LOCK CHAMBER

6. Multivessel Lockage - more than one vessel or tow is served in a single lockage cycle. A separate Lockage Log and Vessel Log is completed for each vessel served. Cargo carrying vessels and towboats with barges (tows) are considered in defining multiple lockages.

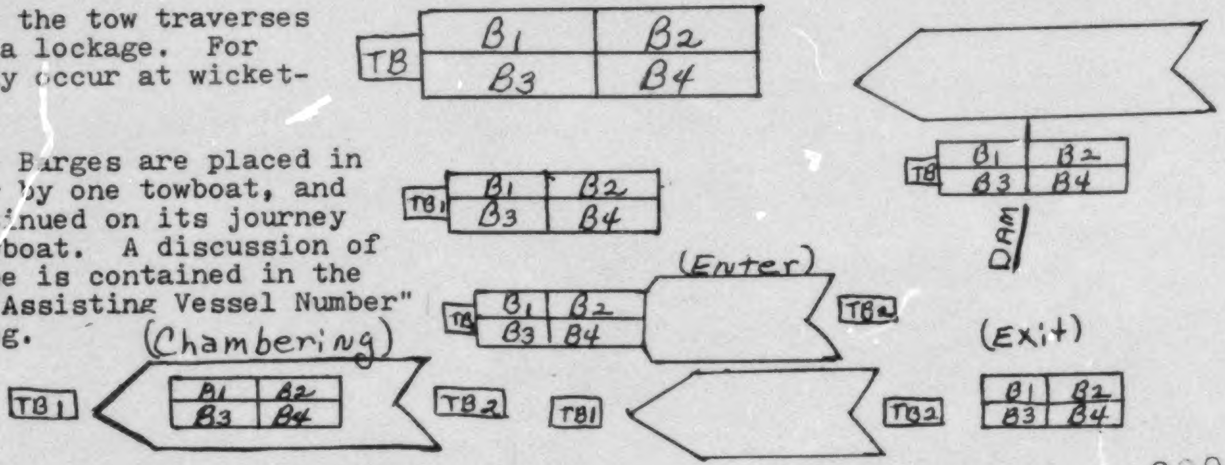

B1
B2
B1
B2
B1
B2
B1
B2

7. Fast Double - the towboat and possibly some of its barges are separated from the remaining barges and are locked through a different chamber from the remaining barges.


TB
B1
B2
B3
B4
First Chamber
B1
B2
B3
B4
Second Chamber
TB

8. Navigable Pass - the tow traverses the dam without a lockage. For example, this may occur at wicket-type dams.

9. Barge Transfer - Barges are placed in the lock chamber by one towboat, and removed and continued on its journey with another towboat. A discussion of this lockage type is contained in the description of "Assisting Vessel Number" on the Vessel Log.


TB
B1
B2
B3
B4
TB
B1
B2
B3
B4
DAM
TB1
B1
B2
B3
B4
(Enter)
TB
B1
B2
B3
B4
TB2
(Chambering)
TB1
B1
B2
B3
B4
TB2
TB1
TB2
(Exit)
B1
B2
B3
B4

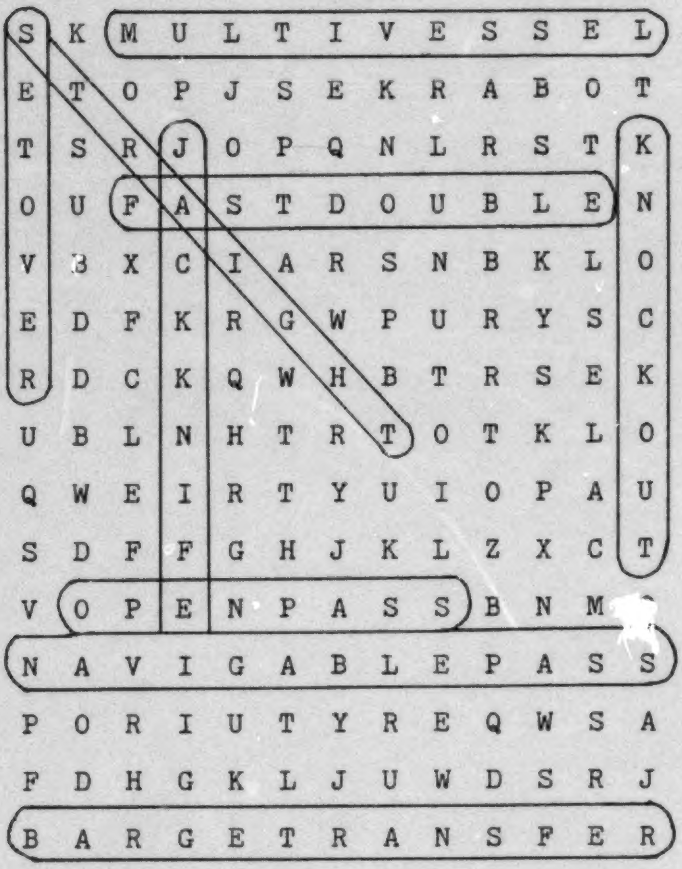
Word Search Puzzle

Different types of lockage listed below can be found in the Word Search Puzzle. They are hidden horizontally, vertically, diagonally, and forward. Draw a circle around all the letters of the complete term.

S	K	M	U	L	T	I	V	E	S	S	E	L
E	T	O	P	J	S	E	K	R	A	B	O	T
T	S	R	J	O	P	Q	N	L	R	S	T	K
O	U	F	A	S	T	D	O	U	B	L	E	N
V	B	X	C	I	A	R	S	N	B	K	L	O
E	D	F	K	R	G	W	P	U	R	Y	S	C
R	D	C	K	Q	W	H	B	T	R	S	E	K
U	B	L	N	H	T	R	T	O	T	K	L	O
Q	W	E	I	R	T	Y	U	I	O	P	A	U
S	D	F	F	G	H	J	K	L	Z	X	C	T
V	O	P	E	N	P	A	S	S	B	N	M	O
N	A	V	I	G	A	B	L	E	P	A	S	S
P	O	R	I	U	T	Y	R	E	Q	W	S	A
F	D	H	G	K	L	J	U	W	D	S	R	J
B	A	R	G	E	T	R	A	N	S	F	E	R

1. Barge Transfer
2. Fast Double
3. Jackknife
4. Knockout
5. Multivessel
6. Navigable Pass
7. Open Pass
8. Setover
9. Straight

Word Search Puzzle Key



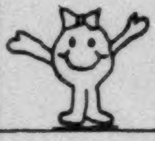
S	K	M	U	L	T	I	V	E	S	S	E	L
E	T	O	P	J	S	E	K	R	A	B	O	T
T	S	R	J	O	P	Q	N	L	R	S	T	K
O	U	F	A	S	T	D	O	U	B	L	E	N
V	B	X	C	I	A	R	S	N	B	K	L	O
E	D	F	K	R	G	W	P	U	R	Y	S	C
R	D	C	K	Q	W	H	B	T	R	S	E	K
U	B	L	N	H	T	R	T	O	T	K	L	O
Q	W	E	I	R	T	Y	U	I	O	P	A	U
S	D	F	F	G	H	J	K	L	Z	X	C	T
V	O	P	E	N	P	A	S	S	B	N	M	[illegible]
N	A	V	I	G	A	B	L	E	P	A	S	S
P	O	R	I	U	T	Y	R	E	Q	W	S	A
F	D	H	G	K	L	J	U	W	D	S	R	J
B	A	R	G	E	T	R	A	N	S	F	E	R

Name ______________________________

Occupational Cluster Marine/Fresh Water - Lock Operator

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading the Career Information Sheet					
Reviewing types of lockage on Information Sheet A					
Completing the Word Search Puzzle					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Longshoreman	DOT CODE: 911.663-014

DUTIES:

A longshoreman operates material-handling equipment, such as power winch, grain trimmer, crane, and lift truck, to transfer cargo into or from hold of the ship and about the deck area. This employee operates a crane or winch to load or unload cargo, such as automobiles, crates, scrap, and steel beams, using a hook, magnet, or sling attached in accordance with signals from other workers. S/He moves the controls to start the flow of grain from spouts of grain trimmer, stopping the flow and repositioning spout over each hatch when previous hatch is filled.

The longshoreman may drive a lift truck along the dock or aboard ship to transfer bulk items, such as lumber, pallet-mounted machinery, and crafted products within range of the winch. Sometimes, s/he may drive a tractor to transfer loaded trailers from a warehouse to the dockside.

Also included in the responsibilities associated with this job is the task of positioning and fastening hose lines to ships' cargo tanks when loading or unloading liquid cargo, such as animal fats, vegetable oils, molasses, or chemicals. The longshoreman may perform a variety of manual duties, such as lashing and shoring cargo aboard ship, attaching slings, hooks, or other lifting devices to winch for loading or unloading, and signaling other workers to move, raise, or lower cargo.

WHERE EMPLOYED:

Longshoremen may find employment at a stevedoring company, a terminal operator, or warehouses who store merchandise. They may work on either the Atlantic or Pacific Coasts, where huge oceangoing vessels dock; or on the Gulf Coast, where a lot of the shipping comes from other American cities. Some of these workers find employment at an inland port like Duluth, Minnesota, where ships travel by way of the Great Lakes.

EMPLOYMENT OUTLOOK:

The employment outlook is expected to be steady during the 1980's. Machinery today does some of the jobs longshoremen used to do by hand; however, men are needed to direct the machinery. As long as ships sail the seas, there should be jobs for longshoremen to unload and load them.

EDUCATION AND TRAINING:

Persons aspiring to work as longshoremen should complete a high school education before they plan to work full time loading and/or unloading ships. There is no special training required. A gang boss tells the workers what to do on each job.

SPECIAL QUALIFICATIONS:

Because longshoremen always work in a gang, aspirants must be able to get along well with people. These workers should be ready and willing to work whenever jobs are available.

EARNINGS AND ADDITIONAL BENEFITS:

Beginning wages for longshoremen average about $5.50 an hour. Hours in excess of 40 per week receive time and a half.

In order to get fringe benefits like paid insurance and pension rights, the longshoremen have to each work

800 hours in a given year, or about five steady months of work.

WORKING CONDITIONS AND LIFESTYLES:

As longshoremen, these employees work with many other people. Usually, they work as a gang. A gang can range from ten to twenty members. There are deck, dock, and hold workers in each group. The gang boss works on the deck, and so does the winch man. Two or more persons work on the dock. The rest of the gang works in the hold of the ship.

Each gang works at a certain pier, on a certain ship, until that ship has been completely unloaded and reloaded again. Sometimes, a gang works around the clock, with employees taking turns having naps.

Longshoremen work outdoors in all kinds of weather. There is a great deal of noise and movement while loading and/or unloading ships. These workers lift many heavy objects. The workers assigned in the hold of the ship often find it a very hot place to work. The longshoremen who work on the deck or the dock, often find it windy.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

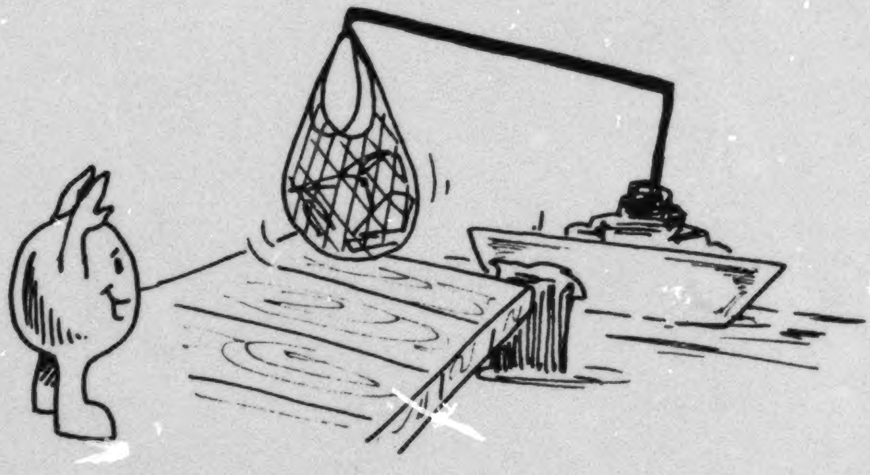
OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Longshoreman	911.663-014
Winch Operator	911.663-014
Boat Loader	911.364-014
Stevedore I	911.663-014

OCCUPATIONAL TASK: Investigating the working conditions of longshoremen

OCCUPATIONAL COMPETENCY: Working in a "gang" situation



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A - "Possible Problems Facing Longshoremen"
3. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize the importance for being able to work well with other people.
2. Evaluate employer-employee situations.
3. Discuss advantages and disadvantages of working as a longshoreman.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Define "pleasing personality." How can a junior high student develop a pleasing personality?
3. Discuss some advantages/disadvantages for becoming employed as a longshoreman.
4. Divide the students into groups and allow each group to draw an activity from an envelope. Each group should prepare a solution for the problem.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participation in class discussions in completing Numbers 2, 3, and 4 under Learning Activities.
3. Completing and submitting the Student Attitude Sheet to the teacher.

Activity Sheet A

"POSSIBLE PROBLEMS FACING LONGSHOREMEN"

Longshoremen are the people responsible for loading and/or unloading ships when they arrive at various ports. A port may be found in any city that has a harbor large enough and deep enough for big ships to dock and load/unload their cargoes.

Cargoes which must be loaded/unloaded on ships may consist of one item or a variety of items, such as wheat, bananas, flour, liquids, and/or heavy machinery.

Usually, longshoremen work together as a gang to complete a job. Each gang works at a certain pier, on a certain ship, until that particular ship has been completely unloaded and reloaded again. Once the task for a particular ship has been completed, a new job for another ship has to be sought. This is usually done by reporting to the hiring hall at the port and finding out what ships need workers. Some gangs who work regularly together have a "hatch boss" who takes care of getting jobs for that team of workers.

The following activities have been designed to provide experiences for students to interact in group settings with respect to possible problems which may be encountered while working as longshoremen. Each group should carefully discuss the hypothetical situation, choose a spokesman and recorder, and prepare to present the information to the entire class.

Activity I

You have been working at Pier 52 in Florida for the past five years and you are happy with your job. The work has been regular and your pay has been adequate for your lifestyle. For the past two weeks, another longshoreman with whom you had been assigned to work in the hold of the ship has been absent from work because of injuries received in a motorcycle accident. At this time, it cannot be determined when your favorite helper will return to work. In the meantime, the "hatch boss" has recruited another longshoreman to substitute for your helper.

This new employee, Mr. X, is 25 years old and has just registered at the port as a longshoreman. He is not experienced. The port is very busy and there is no other person to help you. Mr. X is a chain cigarette smoker and feels he must smoke at least three cigarettes each hour. You do not smoke and know that the rules for smoking stipulate there will be "no smoking" aboard the ship. You have reported this unpleasant circumstance to the "hatch boss" and he told you to work it out. How would you solve this situation when you must have help to load the cargo and there is no one else to assist you?

Activity II

You have assumed the position as "hatch boss" over a ten-member gang of workers. Your gang has realized the importance for working as fast as possible so that ships are loaded/unloaded and move out of port on schedule. For the past two years, everything associated with your work has been just great.

Suddenly, two men do not report to work. The ship for which your gang is responsible for unloading the heavy machinery equipment is scheduled to leave port in three days. It would take your ten-member gang working at least 18 hours a day to complete the job. What are your alternatives when so much is at stake?

Activity III

Two women have been registered at the S.A. Memphis Port for three months. As "hatch boss" of a ten-member gang, you have been able to keep the gang employed at least 20 days of each month. All the ten members constituting the work team are males. You need at least two more workers to help with the additional work in the future and to substitute for workers who will be taking a week's vacation during June-August. You have discussed the possibility of hiring these two female workers and your ten-member gang of males said they would all quit the first day females come to work in their crew of workers. How might this problem be solved?

Activity IV

The usual way for longshoremen to get jobs is to go to the hiring hall located at each port to find out what ships need workers. If you belong to a regular gang of workers, your "hatch boss" takes care of getting jobs for you. S/He goes to the hiring hall and says that the gang is ready for new work. Then the "hatch boss" lets the gang know they are needed on a certain pier at a designated time.

If a longshoreman works as an extra man and changes from gang to gang, s/he goes to the hiring hall and seeks opportunities to work. In many of these halls, there are big pegboards to keep track of workers. Names are posted there all the time once longshoremen become registered.

If your name had been posted for six weeks and you had not been given an opportunity to help load/unload cargo, what might you do to demonstrate to the "hatch bosses" that you did really want to work? You may need to consider appearance, attitudes, and interpersonal skills needed while communicating with different people.

Name ____________________

Occupational Cluster Marine/Fresh Water - Longshoreman

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet with respect to Longshoreman					
Discussing advantages and disadvantages for becoming employed as a Longshoreman					
Solving problems associated with Longshoreman activities					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Marina Worker DOT CODE: 915.477-010

DUTIES: A marina worker's duties include maintaining and repairing all types of craft as well as providing weather and navigational information for customers. Some workers may operate charter boats for excursions and deep-sea fishing. In these marinas the workers maintain the boats, help outfit them for trips, and sometimes serve as crew members. Some trained and experienced divers offer diving and salvage service. The marina worker's greatest responsibility is giving boaters information on navigational safety.

WHERE EMPLOYED: Employment opportunities may be found at marinas and boatyards on lakes, seacoasts, and waterways of the United States. New York has the largest number of marinas, followed by Florida, California, Maryland, Connecticut, and Massachusetts.

EMPLOYMENT OUTLOOK: Employment outlook is expected to be favorable during this decade because of increase of marinas and docks being built in new private, state, and federal recreation areas. Many existing marinas are expanding rapidly too, creating more jobs for marina workers. The number of workers needed will depend upon the growth and prosperity of the entire boating industry.

EDUCATION AND TRAINING: A high school education is recommended with emphasis on participation in shop courses. Additional training in evening courses in engines and engine repair may be received at technical and/or post secondary vocational schools. Practical experience is valuable too. Those persons interested in becoming boat mechanics may find an apprenticeship program attractive and very beneficial to them. In addition aspirants can learn more about repairing and caring for marine engines by taking one of the two- or three-week courses offered by several large manufacturers of marine engines.

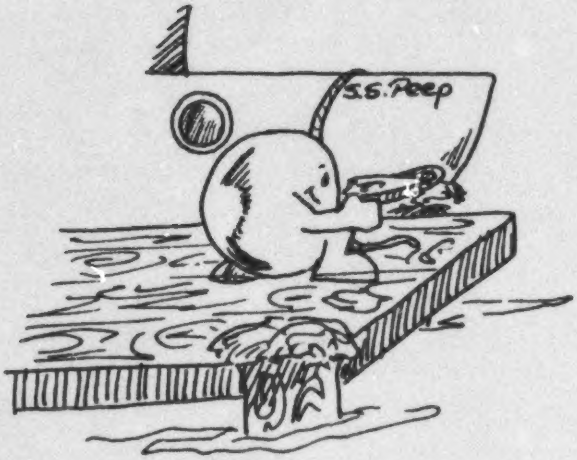
Valuable training and experience in seamanship, navigation, and marine engineering can be found in the navy, Coast Guard, or merchant marines. The armed services also provide valuable training in electronics, diesel operation, and weather study. Persons living near a lake or an ocean may be able to find courses in navigation and seamanship offered by boating clubs, the Coast Guard Power Squadron, and other groups.

SPECIAL QUALIFICATIONS: Aspirants should genuinely like boats and boating enthusiasts. Marina personnel must have a great deal of knowledge about local waters and about boating skills in general.

EARNINGS AND ADDITIONAL BENEFITS: Skilled marina workers may expect pay on an hourly basis, especially if they are hired only as special jobs arise. Some employers choose to pay employees on a commission basis---a percentage (about 50 percent) of what the customer is charged for labor. Marina workers who also sell equipment, hardware, and boats may be paid a commission on their sales. Depending on the size and location of the marina and the trade involved, annual earnings for skilled workers could range anywhere between $6,500 and $13,000.

WORKING CONDITIONS AND LIFESTYLES: A marina helper usually works 40 hours a week; however, the work schedule may be different from day to day or week to week. Usually when overtime hours are worked, extra pay is given to the employees. Often there is work to be done on weekends. Employees who work on the weekends usually have the same number of days off during the week.

Some marinas are only open during the summer season, usually from May through October. If this be the case, employees may need to find another job for the winter months.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Marina Worker	915.477-010
Marine-Engine Mechanic	623.281-026
Marine Oiler	911.584-010
Marine Machinist	623.281-030

OCCUPATIONAL TASK: Reviewing Marinas

OCCUPATIONAL COMPETENCY: Planning to work near water

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Testing Your Interests
3. Activity Sheet A
4. Student Attitude Sheets

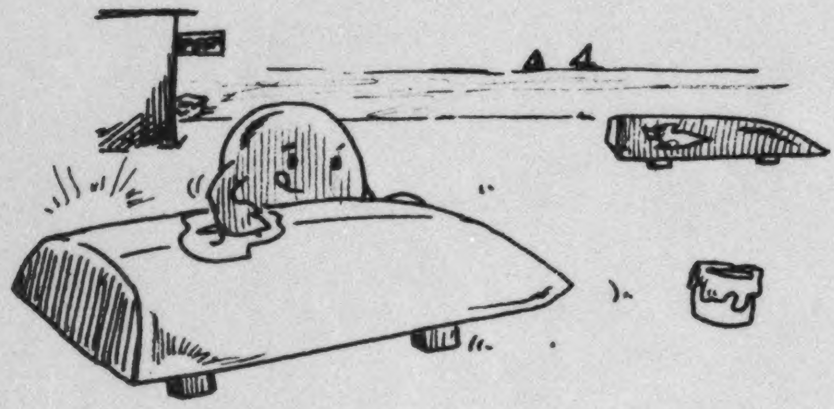
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Better appreciate marina workers.
2. Realize services provided by marinas.
3. Determine whether you may want to further investigate this field of work.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Complete Testing Your Interests.
3. Design a marina using Activity Sheet A.
4. Complete Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Completing Testing Your Interests.
2. Designing and submitting to the teacher a modern marina.
3. Completing Student Attitude Sheet.

Testing Your Interests

Read the following questions carefully and answer either "yes" or "no." If you can answer "yes" to most of them and the occupation sounds interesting to you, perhaps you may want to look further into marina work.

______ 1. Do you like to be out-of-doors a lot of the time?

______ 2. Do you know how to swim?

______ 3. Do you enjoy boating?

______ 4. Would you be willing to work odd hours such as in the evenings and/or on weekends?

______ 5. Have you any experience in pumping gas?

______ 6. Do you take pride in doing your work?

______ 7. Do you prefer to be busy doing a variety of activities rather than just one?

______ 8. Do you mind taking instructions from other people?

______ 9. Can you work well under pressure?

______ 10. Would you be willing to study the principles of water safety?

Activity Sheet A

Designing A Marina

Some day you may choose to work in another state where there is a very large marina. Design a marina for which you would like to become employed. The following services may need to be provided:

(a) services to moor boating craft

(b) repair services

(c) food for purchasing

(d) parts and supplies for purchasing

Below is a partial listing that you may choose to include in your drawing.

a. dock

b. number of slips, or parking places, for boats

c. repair shop that has equipment, tools, and cranes for lifting boats

d. gasoline pumps that contain marine fuel

e. snack bar and restrooms

f. dining rooms, tennis courts, and a swimming pool

g. large chalkboard placed at center to provide up-to-date information on the weather or wind

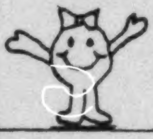
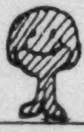
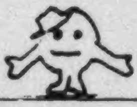
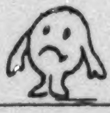
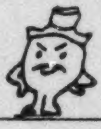
h. other(s)

Name ____________________

Occupational Cluster Marine/Fresh Water -- Marina Worker

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it 
Reading Career Information Sheet					
Responding to "Testing Your Interests"					
Designing a modern marina					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Marine Engineer   **DOT CODE:** 014.061-014

DUTIES:

Marine Engineers design and oversee installations and repairs of marine power plants, propulsion systems, heating and ventilating systems, and other mechanical and electrical equipment in ships, docks, and marine facilities.

They study drawings and specifications and perform complex calculations to conceive equipment and systems designed to meet requirements of marine craft or facility. These workers oversee and evaluate operations of equipment during acceptance testing and shakedown cruises.

Marine engineers may specialize in design of equipment, such as boilers, steam-driven reciprocating engines, heat exchangers, fire-control and communication systems, electric power systems, or piping and related fittings and valves.

WHERE EMPLOYED:

These workers are employed by tanker companies, oceangoing vessel ports along the Atlantic, Gulf, and Pacific coasts, and the Great Lakes. Ships with large amounts of specialized equipment carry engineers whose particular duties are the operation and repair of such machinery.

EMPLOYMENT OUTLOOK:

The employment outlook for aspirants to this career is somewhat bleak. Competition for positions on ships is expected to be keen. Nevertheless, there will probably be some opportunities for employment due to retirement, death, or transfer of workers to other jobs.

Some new opportunities for employment are materializing in domestic shipping on the Great Lakes and the nation's major rivers, as well as in the offshore mineral and oil industry.

EDUCATION AND TRAINING: There are no specific educational requirements for entry into this career. A sailor with only three years' experience in the engine department may be eligible to apply for a job as third assistant engineer. However, the applicant must pass a difficult Coast Guard examination in order to obtain a license.

Training programs are available at five state merchant marine academies. Entrance requirements are very high.

Nominations made by U.S. Senate or House of Representatives can help a student to be admitted in a federal academy. Most of the academies offer practical experience at sea, in addition to the three- or four-year courses in marine engineering.

SPECIAL QUALIFICATIONS: Marine engineers must be licensed by the U.S. Coast Guard. Aspirants should possess unusual mechanical aptitude and superior mathematical ability.

These applicants must be in good physical condition. Individuals in this career should be able to demonstrate leadership ability in their relationships with subordinates. Managerial and organizational skills are essential.

It is desirable that these workers be emotionally mature, strong, and enduring to cope with the conditions of the confinement to the ship.

EARNINGS AND ADDITIONAL BENEFITS:

Earnings vary for marine engineers due to each worker's license, class of vessel where work is being performed, overtime, and supplementary pay for certain duties.

Marine engineers receive free living quarters and meals on board ship. Vacations for workers in this career range from 90 to 180 days a year. Fringe benefits include retirement plans and medical and hospitalization programs.

The average pay for a deep-sea Marine Engineer is approximately $1,500 monthly for a third assistant engineer and about $3,000 monthly for a chief engineer. These workers on ships in the Great Lakes may earn an additional $300 per month.

WORKING CONDITIONS AND LIFESTYLES:

Modern ships are equipped to provide comfortable living quarters with adequate space and air conditioning. Generally, the engine rooms are clean and well lighted.

When these workers are at sea, they usually are scheduled to work two four-hour shifts during every 24-hour period and have eight hours off between each watch. Some officers may be required to work eight hours a day Monday through Friday. All workers receive overtime pay for work over 40 hours a week. The workweek is 40 hours when the ship is in port.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

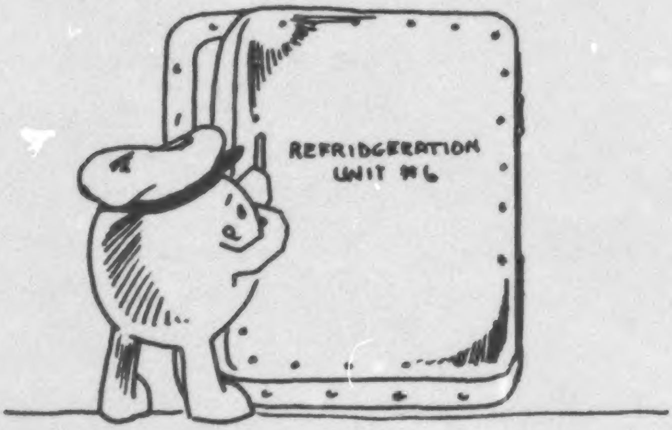
OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Marine Engineer	014.061-014
Design Engineer, Marine Equipment	014.061-010
Research Engineer, Marine Equipment	014.061-018
Drafter, Marine	014.281-010

OCCUPATIONAL TASK: Investigating occupations of an engineering staff

OCCUPATIONAL COMPETENCY: Identifying occupational specialties



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Copies of Information Sheet I - Engine Department Specialties or transparency
3. Hidden-Word Puzzle
4. Student Attitude Sheets

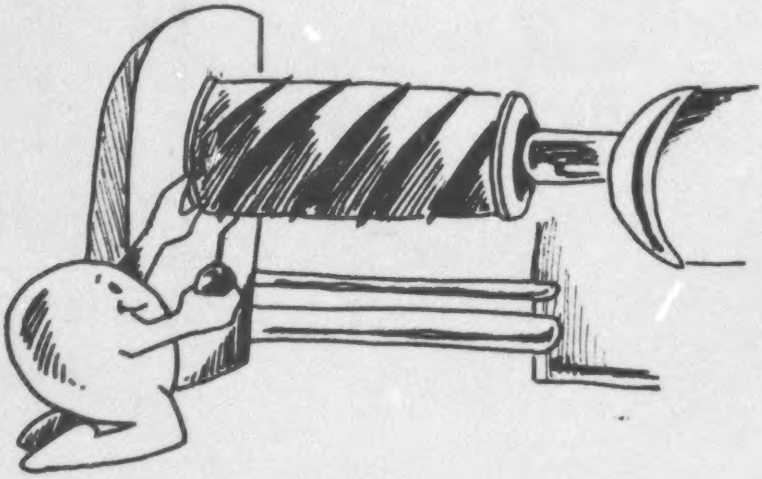
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Determine if you want to examine this vocation further as a possible career.
2. Identify some occupations that require a mastery of mathematics, physics, and chemistry.
3. Realize that involvement in high school clubs and student government can be an asset in working as a marine engineer.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Review Information Sheet I - Engine Department Specialties.
3. Complete the Hidden-Word Puzzle.
4. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Reviewing Information Sheet I.
3. Completing the Hidden-Word Puzzle.
4. Completing the Student Attitude Sheet.

Information Sheet I

Engine Department Specialties

1. Wipers - Workers who keep the engine room and machinery clean. Most cargo vessels carry two or three wipers.

2. Oilers - Persons employed to lubricate mechanical equipment. These workers make regular rounds of ship machinery to check oil flow and pressures. They may also help overhaul and repair machinery.

3. Firers - Watertenders - Employees who check and regulate the amount of water in the boilers, inspect gauges, and regulate fuel flow to keep steam pressure constant. They also check the operation of evaporators and condensers, which are used to convert salt water to fresh water.

4. Ship's Electrician - Workers who repair and maintain electrical equipment, such as generators and motors. These electricians also test wiring for short circuits and remove and replace fuses and defective lights.

5. Refrigeration Engineers - Persons employed to maintain proper temperatures in refrigerator compartments for perishable cargoes such as meat and vegetables.

Hidden-Word Puzzle

The engineering staff of a ship consists of workers who have a variety of occupational specialties requiring varying degrees of skill. Try your skill at completing the hidden-word puzzle.

R	A	S	C	D	F	G	H	J	K	L	Q	W	E	S	R	T	Y	A
E	L	U	H	K	A	S	M	I	D	R	Z	X	B	E	N	T	O	S
F	Q	W	I	P	O	I	U	Y	T	R	W	M	V	C	O	K	R	D
R	I	J	E	L	K	J	H	G	F	D	S	A	F	O	A	Z	C	F
I	M	R	F	B	V	C	X	Q	W	E	R	I	I	N	T	Y	U	G
G	L	K	E	J	H	G	F	D	S	A	Q	N	R	D	W	E	T	H
E	R	T	N	R	Y	U	I	O	P	M	B	T	S	A	N	V	H	J
R	Z	A	G	Q	S	W	E	R	D	P	O	E	T	S	T	N	I	K
A	A	S	I	D	F	W	I	P	E	R	S	N	A	S	G	H	R	L
T	P	O	N	I	U	Y	A	T	C	R	E	A	S	I	W	Q	D	Q
I	A	S	E	D	F	G	H	T	K	J	K	N	S	S	U	O	A	W
O	I	L	E	R	S	D	U	P	E	K	R	C	I	T	E	I	S	E
N	L	K	R	G	H	F	D	D	N	R	S	E	S	A	R	K	S	R
E	O	I	U	Y	T	R	Z	V	G	E	T	P	T	N	D	S	I	T
N	A	S	D	L	K	J	H	F	I	G	T	E	A	T	E	W	S	Y
G	W	Q	R	E	T	Y	U	B	N	E	A	R	N	S	P	Q	T	U
I	P	O	G	H	M	R	O	K	E	S	D	S	T	D	U	P	A	I
N	M	B	V	C	S	P	C	W	R	L	K	O	G	T	E	A	N	O
E	P	O	U	T	R	E	W	B	O	V	C	N	K	Z	A	R	T	P
E	T	P	O	H	A	J	K	M	O	B	C	L	R	A	K	F	S	Z
R	P	O	I	J	K	F	G	P	M	E	C	H	A	N	I	C	Z	D
S	H	I	P	S	E	L	E	C	T	R	I	C	I	A	N	L	R	K

Locate the following terms in the Word Search Puzzle above.

1. Maintenance Person
2. Wipers
3. Refrigeration Engineers
4. Oilers
5. Firers-Watertenders
6. Ship's Electrician
7. Deck Engine Room Mechanic
8. Chief Engineer
9. Third Assistants
10. First Assistant
11. Second Assistant

Hidden-Word Puzzle - Key

R A S C D F G H J K L Q W E S R T Y A
E L U H K A S M I D R Z X B E N T O S
F Q W I P O I U Y T R W M V C O K R D
R I J E L K J H G F D S A F O A Z C F
I M R F B V C X Q W E R I I N T Y U G
G L K E J H G F D S A Q N R D W E T H
E R T N R Y U I O P M B T S A N V H J
R Z A G Q S W E R D P O E T S T N I K
A A S I D F W I P E R S N A S G H R L
T P O N I U Y A T C R E A S I W Q D Q
I A S E D F G H T K J K N S S U O A W
O I L E R S D U P E K R C I T E I S E
N L K R G H F D D N R S E S A R K S R
E O I U Y T R Z V G E T P T N D S I T
N A S D L K J H F I G T E A T E W S Y
G W Q R E T Y U B N E A R N S P Q T U
I P O G H M R O K E S D S T D U P A I
N M B V C S P C W R L K O G T E A N O
E P O U T R E W B O V C N K Z A R T P
E T P O H A G K M O B C L R A K F S Z
R P O I J K F G P M E C H A N I C Z D
S H I P S E L E C T R I C I A N L R K

Name ______________________________

Occupational Cluster Marine/Fresh Water - Marine Engineer

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Learning about Engine Department Specialties					
Completing a Hidden-Word Puzzle					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Master, Yacht DOT CODE: 197.133-014

DUTIES: This employee commands yacht cruising on oceans, bays, lakes, and coastal waters. S/He sets the course for the yacht, using navigational aids, such as charts, area plotting sheets, compass, and sextant.

Other duties include signaling passing ships by using a whistle, flashing lights, flags, and/or radio. When approaching land, this employee utilizes aids to navigation such as lights, lighthouses, and buoys. Lastly, s/he maintains a log of everyday happenings.

WHERE EMPLOYED: Persons employed as yacht masters usually work for companies who provide cruises on oceans, bays, lakes, and/or coastal waters. Some persons may own their own yacht and be self-employed.

EMPLOYMENT OUTLOOK: The employment outlook for the 1980's is expected to be very limited for persons aspiring to become employed as yacht masters. Opportunities for employment may become available as persons retire, die, or change places of employment.

EDUCATION AND TRAINING: At least a high school education with much concentration in courses pertaining to math is highly recommended. The knowledge necessary to obtain a required operator's license issued by the Coast Guard includes: use of nautical charts; determining and laying compass courses; International and Inland Rules of the Road; rudimentary seamanship; and handling the yacht in heavy weather, etc.

Private businesses may offer courses in teaching interested persons how to be captains.

SPECIAL QUALIFICATIONS: This worker may be licensed by U.S. Coast Guard for steam or motor yacht according to waters navigated and tonnage of yacht.

It is imperative that s/he have excellent visual acuity and color perception and be of good health and physical endurance. Lastly, the yacht master should have a pleasing personality and be able to get along well with people.

EARNINGS AND ADDITIONAL BENEFITS: The earnings of a yacht master are dependent upon the experience of the master and the employer who has hired him/her.

Fringe benefits also vary according to the employer. Most yacht masters working for private companies have hospitalization insurance, a plan for retirement, vacation with pay, annual sick leave, and some holidays off with pay.

WORKING CONDITIONS AND LIFESTYLES: A yacht master may expect to work many long hours while on duty, depending upon the destination of the yacht. S/He is expected to be available and prepared to respond to emergencies any time while on a pleasure trip.

Most of the larger yachts have comfortable living quarters; however, the employee may have to be absent from his/her home and/or family for extended periods of time.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

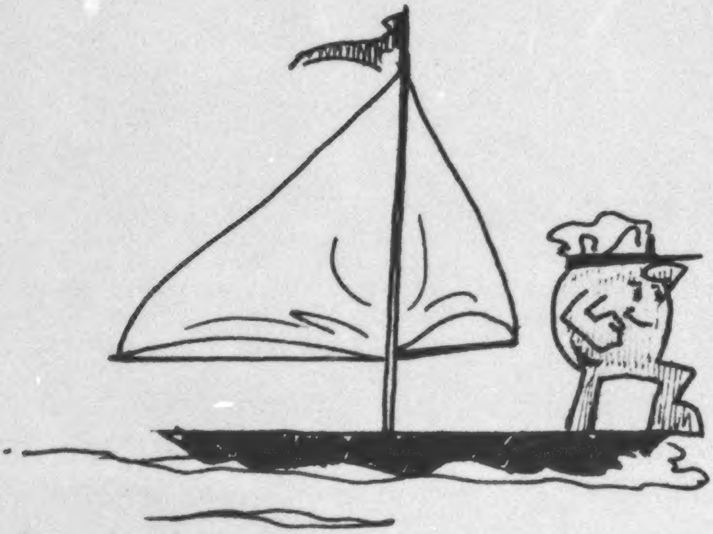
Master, Yacht	197.133-014
Captain, Fishing Vessel	197.133-010
Mate, Fishing Vessel	197.133-018

OCCUPATIONAL TASK: Exploring yachting

OCCUPATIONAL COMPETENCY: Planning activities for a yacht club

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A - TYPES OF YACHTS
3. Information Sheet B - YACHT CLUBS
4. Activity Sheet A - PLANNING ACTIVITIES
5. Student Attitude Sheet



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become familiar with types of yachts.
2. Become more knowledgeable of previous yacht clubs.
3. Determine if you want to continue to explore yachting.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Become familiar with Information Sheet A - TYPES OF YACHTS.
3. Review Information Sheet B - YACHT CLUBS.
4. Divide the class into groups and complete Activity Sheet A - PLANNING ACTIVITIES.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participation in reviewing Information Sheet A.
3. Listening attentively to discussion of Information Sheet B.
4. Participation in group work while completing Activity Sheet A - PLANNING ACTIVITIES.
5. Completing the Student Attitude Sheet.

Information Sheet A

TYPES OF YACHTS

A yacht is a vessel used only for pleasure. It may be any kind of vessel, from a small sailing boat to a steam-powered, ocean-going vessel. Usually, a yacht can be recognized by its speed, grace, and clean lines.

Sailing yachts may be classified by their rigs. Racing yachts are further divided by their size or rating. Today the jib-headed sail is used on most racing yachts, and it is also being adapted on cruising yachts.

Rig can be defined as an arrangement of masts, spars, and sails on a sailing vessel such as a square rig. The chief rigs used more commonly today are included in the following:

CAT RIG

SLOOP

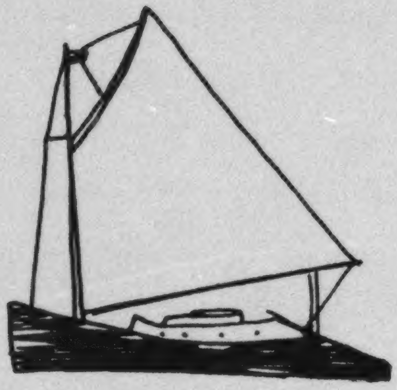
CUTTER

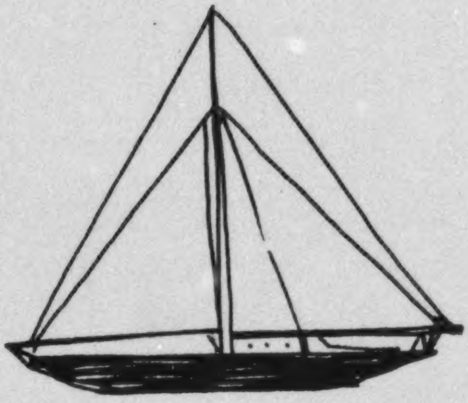
YAWL

KETCH

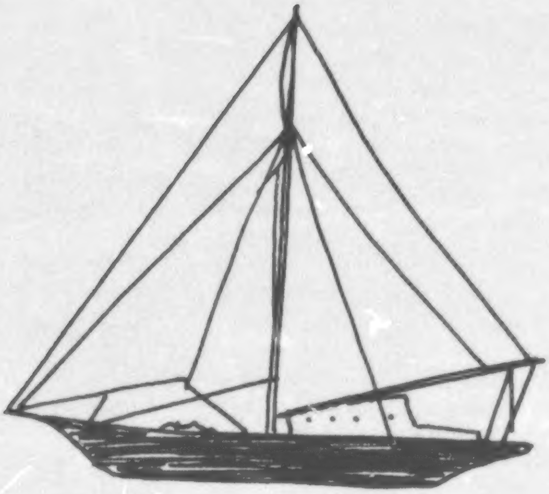
SCHOONER

The cat rig consists of a single sail, called the mainsail, set on a mast set well up in the bow of the boat. A close inspection of a catboat reveals that a centerboard is positioned there to keep it from tipping. Catboats are wide and ride high in the water.

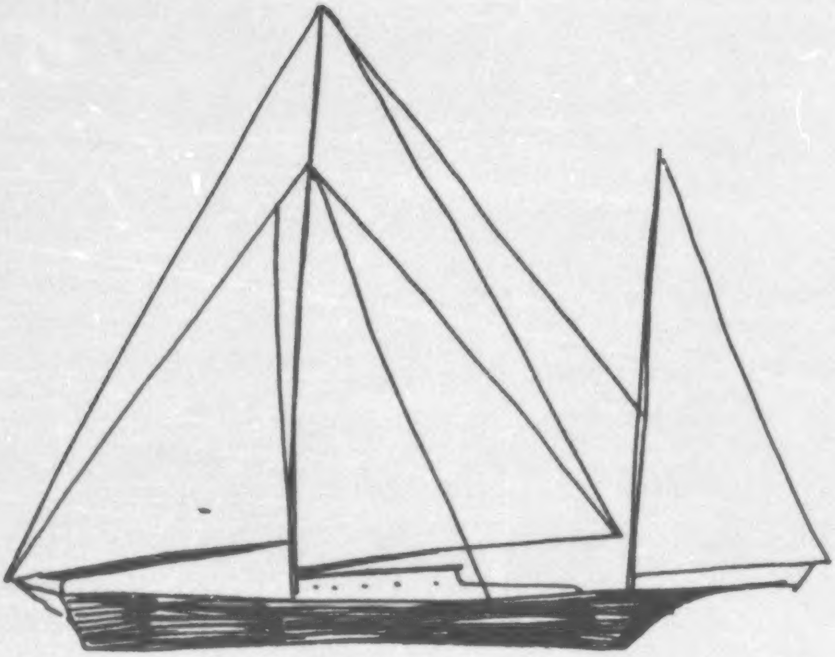




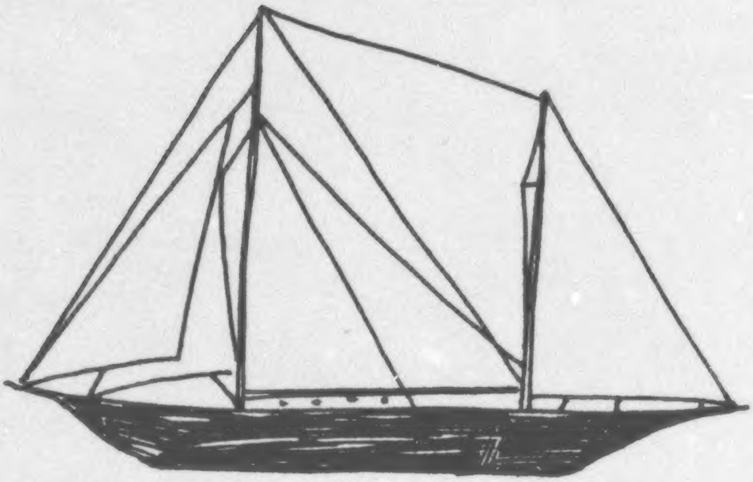
The sloop is a single-masted vessel carrying a mainsail to the rear of the mast and usually a single, narrow, rectangular sail called a jib, or headsail, forward. Many times this rig is used on racing yachts.



A cutter is similar to the sloop; however, it has two or more headsails instead of a single one. Usually, the mast is set farther aft than in a sloop. The cutter rig is also used on many racing yachts.



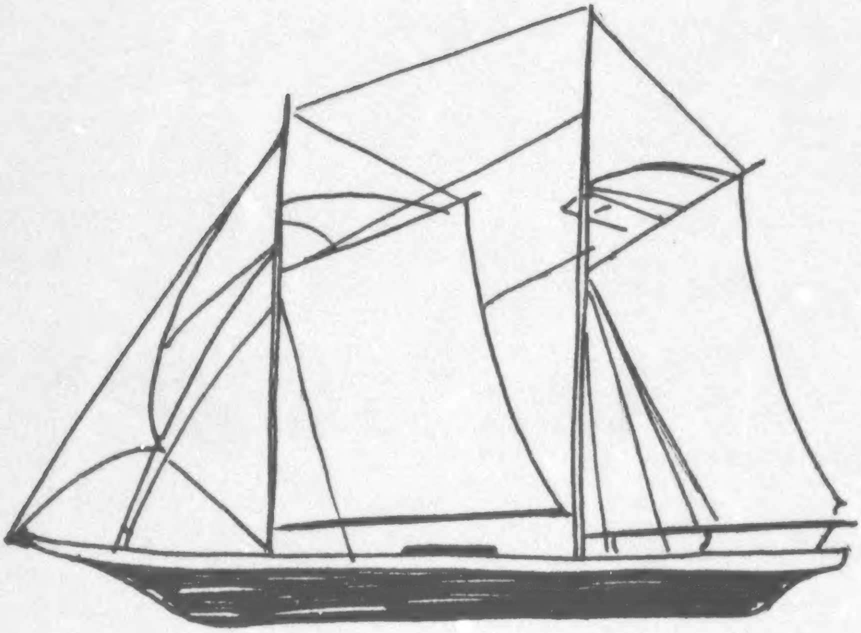
The yawl is a two-masted boat. The mainmast on this rig is larger and placed about where it is in a sloop rig. Yawls may carry either one or more headsails. The mizzenmast, or jigger, is much smaller and set well aft, behind the rudder-head or sternpost.



The ketch rig is similar to the yawl. It has the mainmast and headsails positioned as those in the yawl, but the mizzenmast and sail are larger.

It is in the positioning of the mizzenmast that makes the ketch different from the yawl. The mizzenmast is set forward of the rudderhead or sternpost, or forward of the afterpoint where the hull meets the water.

The ketch is very popular with cruising yachtsmen.



The schooner is also a two-masted vessel with a mainmast and a foremast. Large yachts may have a three-masted schooner rig, the masts being called fore, main, and mizzen. The schooner rig is very handy and used much on cruisers.

Information Sheet B

YACHT CLUBS

Today there are hundreds of yacht clubs devoted entirely to the interests of yachting and powerboating in the United States and Canada. The following list reveals examples of names of yacht clubs which were started as early as 1811.

KNICKERBOCKER BOAT CLUB
(New York)

DETROIT BOAT CLUB
(Michigan)

NEW YORK YACHT CLUB
(New York)

SOUTHERN YACHT CLUB
(Louisiana)

BAY OF QUINTE YACHT CLUB
(Canada)

ACTIVITY SHEET A

PLANNING ACTIVITIES

As master of a yacht in West Virginia, you will have many responsibilities for making long-range plans for keeping up to date with equipment, prices, maintenance, staff development, and other areas of concern associated with operating a business. An excellent way to help you keep abreast of up-to-date information pertaining to yachting is to become a member of a yacht club. There should be many activities that an active yacht club can do which will help its members.

In the space provided below, list four major areas of concern which you feel a master of a yacht would have. Under each area of concern, plan activities which you feel yacht club members could work together to accomplish. Plan a calendar of events for the yacht club to meet and accomplish these activities. Last, give your new yacht club a name.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Master, Yacht

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading the Career Information Sheet					
Becoming familiar with TYPES OF YACHTS					
Reviewing information pertaining to YACHT CLUBS					
Planning activities for a future yacht club					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Mate, Ship DOT CODE: 197.133-022

DUTIES:

Mates of a ship are actually deck officers who supervise and coordinate activities of a crew aboard ship. Three kinds of mates found aboard a ship include the chief mate, second mate, and third mate.

The chief mate is sometimes referred to as a first mate or chief officer. S/He is the captain's key assistant in assigning duties to the deck crew and maintaining order and discipline. The chief mate may also plan and supervise the loading and unloading of cargo and assist the captain in taking the ship in and out of port. On some ships, the chief mate also may be in charge of first aid treatment.

The second mate on a ship is the navigation officer. S/He sees that the ship is provided with the necessary navigation charts and that navigation equipment is maintained properly.

A third mate acts as a signal officer and is in charge of all signaling equipment. S/He also assists in the supervision of cargo loading and unloading. The third mate frequently inspects lifesaving equipment to be sure it is ready for use in fire, shipwreck, or other emergencies.

WHERE EMPLOYED:

Mates on a ship are employed by United States oceangoing vessels. Due to long vacations and other breaks in service such as those resulting from illness, about two officers are employed for every job on a ship. These officers are found on freighters, tankers, and a combination freighter-passenger vessels.

EMPLOYMENT OUTLOOK:

Little change in the employment of shipmates is expected through the 1980's.

Some job openings should occur as a result of the need to replace experienced workers who retire, die, or take other employment.

Job opportunities are expected to be favorable through the 1980's because the demand for officers is expected to exceed the number of graduates from officer training schools.

Job opportunities for merchant marine officers are expected to be excellent in related maritime fields. For example, the expanded interest in offshore mineral and oil exploration should generate a greater need for trained officers to work on oceanographic research and oil exploration vessels.

EDUCATION AND TRAINING:

Candidates must have at least three years of appropriate sea experience or graduate from an approved training program. A sailor with three years' experience in the deck department may apply for a third mate's license.

At the present time, no formal education requirements have been established for officers. However, because of the complex machinery and navigational and electronic equipment on modern ships, formal training usually is needed to pass the Coast Guard's examination for these licenses.

The fastest and surest way to become a well-trained officer is through an established training program. Such programs are available at the U.S. Merchant Marine Academy in New York, California Maritime Academy in California, Great Lakes Maritime Academy in Michigan, Massachusetts

Maritime Academy, and Texas Maritime Academy in Texas, etc.

A number of trade unions in the maritime industry provide officer training.

Some unions sponsor self-study programs for unlicensed sailors to obtain a third mate's license.

Advancement for deck officers is along well-defined lines and depends primarily upon specified sea experience, passing a Coast Guard examination, and leadership ability.

SPECIAL QUALIFICATIONS: Applicants for an officer's license in the deck department of oceaning vessels must meet certain legal requirements. Chief and second mates must be at least 21 years old. The minimum age for third mates is 19. In addition, applicants must present proof of U.S. citizenship and obtain a U.S. Public Health Service certificate attesting to their vision, color perception, and general physical condition.

Deck officer candidates must pass Coast Guard examinations that require extensive knowledge of navigation, cargo handling, and deck department operations.

EARNINGS AND ADDITIONAL BENEFITS: Earnings of officers depend upon their rank and the type of ship. Wages are highest on large ships. The base monthly wages for mates range from $1,400 to $2,250. However, additional payments for overtime or for assuming extra responsibilities generally average about 50 percent of base pay.

Officers and their dependents enjoy substantial pension and welfare benefits. Vacations range from 16 to 30 days of employment.

Comprehensive medical care and hospitalization are provided for officers and their families through employer or union programs.

WORKING CONDITIONS AND LIFESTYLES:

When officers are at sea, they are required to work seven days a week. Generally, they work two four-hour shifts during every 24-hour period and have eight hours off between each shift. All officers are paid for work over 40 hours a week. When the ship is in port, the basic workweek is 40 hours for all crewmembers.

Deck officers must be able to adapt to both bitter cold and the hot sun.

The accommodations for officers aboard U.S. vessels are generally excellent. However, some officers find being confined to a ship for long periods of time boring.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

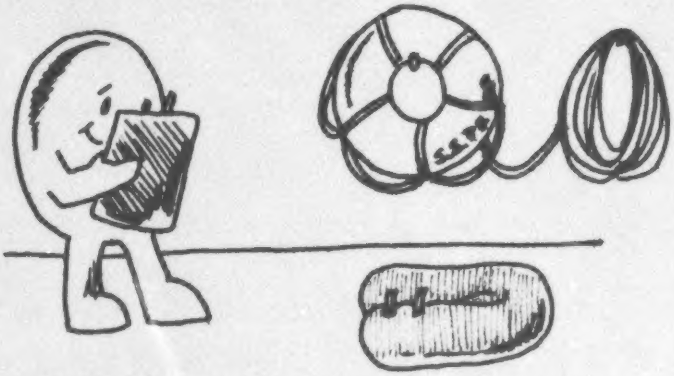
REPRESENTATIVE JOB TITLES:	Mate, Ship	197.133-022
	Tugboat Mate	197.133-034
	Dredge Mate	197.137-010

OCCUPATIONAL TASK: Exploring occupations on a ship

OCCUPATIONAL COMPETENCY: Determining deck officer positions

RESOURCES and/or MATERIALS

1. Occupational Outlook Handbook, 1980-81 Edition, pages 249-250 - "Nature of the Work"
2. Career Information Sheet
3. Activity Sheet A
4. Student Attitude Sheet



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Recognize occupational titles associated with deck officers.
2. Distinguish between first, second, and third mates on an ocean vessel.
3. Determine if you want to explore this occupation further.

LEARNING ACTIVITIES

1. Read Career Information Sheet. The teacher may choose to record on cassette to be shared with the class.
2. Read "Nature of the Work" in Occupational Outlook Handbook (1980-81 Edition) pages 249-250. The teacher may choose to type each different occupation and description on a separate card and distribute cards among groups of students to share with the class.
3. Complete Activity Sheet A.
4. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming knowledgeable of career information pertaining to mates of a ship.
2. Participating in class activity with respect to "Nature of the Work" in the Occupational Outlook Handbook.
3. Completing Activity Sheet A.
4. Completing the Student Attitude Sheet.

Activity A

Marine-Related Occupations

Among other things, deck officers (mates) are responsible for notifying the captain of a ship of any unusual occurrences.

Alphabetize the following occupations. Identify the workers that constitute deck officers of a ship by placing a check mark in front of the occupation. These are deck workers who may be reporting unusual circumstances to the captain.

1. Shipbuilder
2. Shipowner
3. Chief Mate
4. Ship's Captain
5. Chief Engineer
6. Third Mate
7. Radio Officer
8. Pursers
9. Oceanographer
10. Second Assistant Engineer
11. First Mate
12. Second Mate
13. First Assistant Engineer
14. Navigation Officer
15. Coast Guard Member
16. Maritime Lawyer
17. Signal Officer
18. Chief Officer
19. Cartographer
20. Third Assistant Officer

___ 1. ____________________

___ 2. ____________________

___ 3. ____________________

___ 4. ____________________

___ 5. ____________________

___ 6. ____________________

___ 7. ____________________

___ 8. ____________________

___ 9. ____________________

___ 10. ____________________

___ 11. ____________________

___ 12. ____________________

___ 13. ____________________

___ 14. ____________________

___ 15. ____________________

___ 16. ____________________

___ 17. ____________________

___ 18. ____________________

___ 19. ____________________

___ 20. ____________________

Activity A - Key

Marine-Related Occupations

Alphabetized list with identification of occupations pertaining to deck officers.

___ 1. Cartographer

___ 2. Chief Engineer

✓ 3. Chief Mate

✓ 4. Chief Officer

___ 5. Coast Guard Member

___ 6. First Assistant Engineer

✓ 7. First Mate

___ 8. Maritime Lawyer

✓ 9. Navigation Officer

___ 10. Oceanographer

___ 11. Pursers

___ 12. Radio Officer

___ 13. Second Assistant Engineer

✓ 14. Second Mate

___ 15. Shipbuilder

___ 16. Shipowner

___ 17. Ship's Captain

✓ 18. Signal Officer

___ 19. Third Assistant Officer

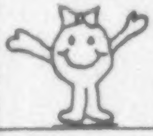
✓ 20. Third Mate

Name ____________________

Occupational Cluster Marine/Fresh Water - Mate, Ship

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming knowledgeable of mates on a ship					
Participating in class activities in "Nature of the Work"					
Alphabetizing Marine-Related Occupations					
Identifying deck officer positions					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

CAREER INFORMATION SHEET

JOB TITLE: Motorboat Mechanic **DOT CODE:** 623.281-038

DUTIES:

Motorboat mechanics install, service, and repair diesel and gasoline-powered inboard and outboard motors. They may be required to make minor adjustments to taking motors apart, testing motors, and examining propellers and propeller shafts. They use testing devices to narrow down problems before beginning to correct problems. In large businesses, managers supervise and coordinate the activities of personnel who make boats seaworthy by repairing and painting them.

WHERE EMPLOYED:

Most motorboat mechanics work for boat dealers and marinas. Marinas hire mechanics so that they can give more service besides fuel, food, and other conveniences to boat owners. Boat and engine manufacturing plants employ motorboat mechanics. Boat rental firms and public marinas (at federal or state parks) also employ them. Florida, Texas, California, Michigan, Minnesota, and Wisconsin have a great many motorboats and motorboat mechanics.

EMPLOYMENT OUTLOOK:

The employment outlook is predicted as a bright future. Increased demands for service will require many skilled motorboat mechanics.

EDUCATION AND TRAINING:

Training may be received on the job or through apprenticeship programs. A high school education is preferred with classes having been in industrial arts, auto repair, and gasoline engine basics. Other good background courses are mathematics, chemistry, physics, and blueprint reading Training may be received in the Armed Forces and can be a substitute for other schooling or on-the-job training.

SPECIAL QUALIFICATIONS:

Individuals who are aspiring to be mechanics should have manual dexterity and an inquisitive mind. Mechanical aptitude is important. Motorboat mechanics must work effectively with the public.

They also need eye-hand coordination to use tools and to work to close tolerances. They also need spatial perception to visualize the relationship between parts as they appear on blueprints or diagrams.

EARNINGS AND ADDITIONAL BENEFITS:

Most motorboat mechanics receive pay calculated on an hourly basis or weekly amount. Some may get a percentage (usually 50 percent) of the labor charge on each repair job. If they work for percentage rates, earnings vary with the amount of work they get and how long they take to do it.

WORKING CONDITIONS AND LIFESTYLES:

Mechanics work both indoors and outdoors. They do outdoor work year-round in warm climates or during warm months elsewhere. Boat shop lighting and ventilation vary. Noise and vibration in this occupation may distract a few individuals or affect their hearing. Hazards in boat service work are sprains from lifting heavy objects or cuts and bruises. Handling greasy motor parts is a necessary part of the work. Often work has to be completed in awkward positions while removing or installing motors. Many motorboat mechanics work a 40-hour workweek. When business is very good, they may even work seven days a week.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

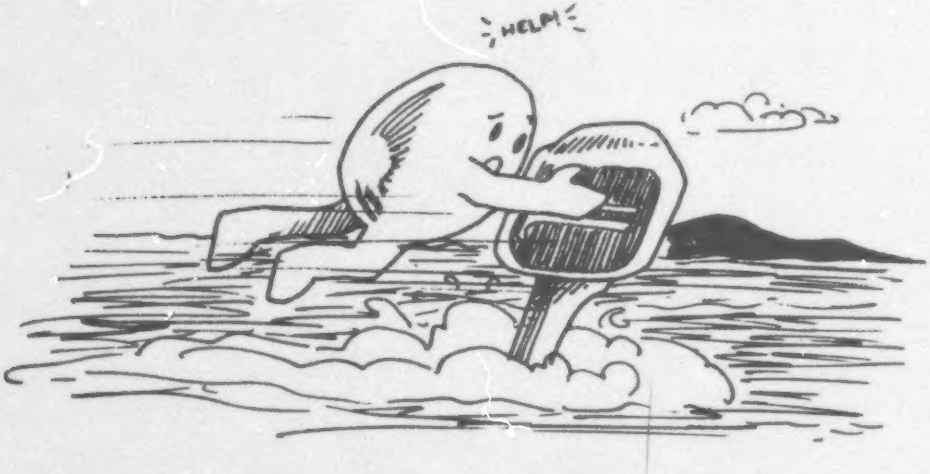
OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Motorboat Mechanic	623.281-038
Machinist, Marine Engine	623.281-026
Maintenance Mechanic, Engine	623.281-034

OCCUPATIONAL TASK: Becoming familiar with motors

OCCUPATIONAL COMPETENCY: Identifying leading manufacturers of outboard motors



RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A

Optional:

a. Variety of magazines displaying pictures of motors, such as "Field & Stream"

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Exhibit an understanding in the field of a motorboat mechanic.
2. Decide whether you may choose to continue to learn about motorboat mechanics.

LEARNING ACTIVITIES

1. Read Career Information Sheet.
2. Complete Activity Sheet A.
3. Write one letter per class requesting a free catalog from a motorboat manufacturer. (Advertisements are printed in magazines, such as the following:
   For a free catalog of Mariner Outboards from 2 to 200 hoursepower, write Mariner, Dept. 83, 1939 Pioneer Road, Fond du Lac, Wisconsin 54935.)
   "Field & Stream," February 1983, p. 103.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading Career Information Sheet.
2. Completing and submitting to the teacher Activity Sheet A.
3. Class participation in writing letter to manufacturer for free catalog.

ACTIVITY SHEET A

As a potential motorboat mechanic, you will need to become familiar with a variety of manufacturers' catalogs. From time to time, you may need information as to where you can order parts, keep up to date on new models of motors being made available to consumers, and/or identifiable changes being made in motors commonly found on the market.

Using the following information pertaining to manufacturers of gasoline and electric outboard motors, prepare a chart displaying all the information.

Neptune Mighty Mite III
Mighty Mite Marine
Colton Road
Old Lyme, Conn. 06371

Gasoline Outboard
2 Horsepower; 1 cylinder;
Weight 20 pounds

Aquabug International
100 Merrick Rd.
Rockville Centre, NY 11750

Gasoline Outboard
1.2 Horsepower; 1 cyl. 13 lbs.
1.75 Horsepower; 1 cyl. 19 lbs.
3.00 Horsepower; 1 cyl. 26 lbs.

Eagle
Byrd Industries
South Industrial Park
Ripley, Tenn 38063

Electric Outboard
No. of Models in Line 15
Remote Bow Mount - yes
Manual Bow Mount - yes
Max Thrust (lbs.) 33
Req. Volts 12
12/24

Evinrude, Johnson
Outboard Marine Corp.
Waukegan, Ill 60085

Electric Outboard
No. of Models in Line 4
Remote Bow Mount - yes
Manual Bow Mount - yes
Max Thrust (lbs.) 33
Req. Volts 12
12/24

Honda
American Honda
100 W. Alonda Blvd.
Gardena, Calif. 90247

Gasoline Outboard
7.5 Horsepower; 2 cyl.;
Weight 77-80 lbs.
9.9 Horsepower; 2 cyl.;
Weight 77-80 lbs.

Mariner
Mariner Outboards
1939 Pioneer Rd.
Fond Du Lac, Wisc. 54935

Gasoline Outboard

Horsepower	Cyl.	Weight
2	1	22
4	1	43
5	1	42
8	2	61
9.9	2	80

Horsepower	Cyl.	Weight
15	2	80
25	2	103
30	2	112
40	2	143
50	4	168
60	2	194
70	3	194
80	4	254
90	6	286
115	6	286
150	V6	378
200	V6	360

Ram Products
P.O. Box 862
Minden, La. 71055

Electric Outboard
No. of Models in Line 6
Remote Bow Mount - yes
Manual Bow Mount - yes
Max Thrust (lbs.) 34
Req. Volts 12
12/24

Sigma
Shakespeare Tackle Co.
P.O. Drawer S
Columbia, S.C. 29260

Electric Outboard
No. of Models in Line 10
Remote Bow Mount - yes
Manual Bow Mount - yes
Max Thrust (lbs.) 28
Req. Volts 12

Silver Troll Ind.
P.O. Box H
Pierce City, Mo. 65723

Electric Outboard
No. of Models in Line 11
Remote Bow Mount - yes
Manual Bow Mount - yes
Max Thrust (lbs.) 28.5
Req. Volts 12
12/24

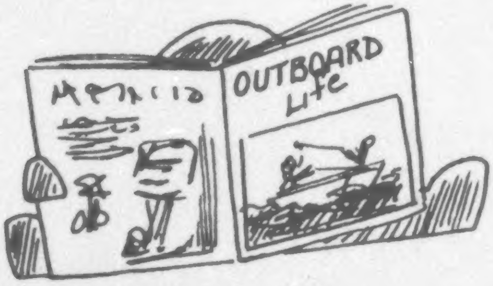
Activity Sheet A - Key

GASOLINE OUTBOARDS

MANUFACTURER	HP	CYL	WEIGHT
AQUABUG	1.2	1	13
100 Merrick Rd.	1.75	1	19
Rockville Centre, NY 11750	3.00	1	26
HONDA (4 cycle)	7.5	2	77-80
American Honda	9.9	2	77-80
100 W. Alonda Blvd.			
Gardena, Calif. 09247			
MARINER	2	1	22
Mariner Outboards	4	1	43
1939 Pioneer Rd.	5	1	42
Fond Du Lac, Wisc. 54935	8	2	61
	9.9	2	80
	15	2	80
	25	2	103
	30	2	112
	40	2	143
	50	4	168
	60	2	194
	70	3	194
	80	4	254
	90	6	286
	115	6	286
	150	V6	378
	200	V6	360
NEPTUNE MIGHTY MITE III	2	1	20
Mighty Mite Marine			
Colton Rd.			
Old Lyme, Conn. 06371			

ELECTRIC OUTBOARDS

MANUFACTURER	No. of Models In Line	Remote Bow Mount	Manual Bow Mount	Max Thrust (lbs.)	Req. Volts
EAGLE Byrd Industries South Industrial Park Ripley, Tenn. 38063	15	yes	yes	33	12 12/24
EVINRUDE, JOHNSON Outboard Marine Corp. Waukegan, Ill. 60085	4	yes	yes	33	12 12/24
SIGMA Shakespeare Tackle Co. P.O. Drawer S Columbia, S.C. 29260	10	yes	yes	28	12
SILVER TROLL Ind. P.O. Box H Pierce City, Mo. 65723	11	yes	yes	26.5	12 12/24



CAREER INFORMATION SHEET

JOB TITLE: Pilot, Ship **DOT CODE:** 197.133-026

DUTIES:

This worker commands ships and or tugboats to steer them into and out of harbors, estuaries, straits, sounds, on rivers, lakes, and bays. S/He directs course and speed of a ship on the basis of specialized knowledge of local winds, weather, tides, and current.

The pilot of the ship/tugboat orders the worker at the helm to steer ship, and navigates the ship to avoid reefs, outlying shoals, and other hazards to shipping, utilizing aids to navigation, such as lighthouses and buoys. S/He may sometimes signal a tugboat captain to berth and unberth a ship.

WHERE EMPLOYED:

Towing companies who move barges using towboats hire pilots to assist in steering the water vessels on rivers and/or lakes.

EMPLOYMENT OUTLOOK:

Little change in the employment of pilots of ships is expected through the 1980's.

Some job openings are expected to occur as a result of the need to replace experienced workers who retire, die, or take shoreside employment.

EDUCATION AND TRAINING:

A high school education is recommended for anyone wanting to become a pilot of a ship. A person must pass a qualifying examination and usually must have spent a designated amount of time at a lower rank in order to learn many necessary skills.

SPECIAL QUALIFICATIONS:

This worker must be licensed by the U.S. Coast Guard with limitations indicating the class and tonnage of vessels for which license is valid and route and waters that may be piloted.

EARNINGS AND ADDITIONAL BENEFITS:

The earnings and additional benefits for pilots of water vessels vary according to employer. An expected range of salary is $26,000 to $40,000 annually.

WORKING CONDITIONS AND LIFESTYLES:

As a rule, the pilot of a water vessel can expect to have favorable working conditions. Most of the time, the living facilities aboard ship are comfortable with nutritious meals served to complement his/her stay on the ship.

From time to time, this worker is forced to work under adverse weather conditions which may prove to be uncomfortable. Also, employers may schedule pilots to work various hours - 30 days on the job and then 30 days off, or split shifts consisting of six hours on and six hours off. Consequently, pilots may have to be away from home for extended periods of time and work longer shifts when on duty. Working on a split shift may force a worker to be on duty during the late shift at night.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Freshwater

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Pilot, Ship	197.133-026
Mate, Ship	197.133-022
Master, Riverboat	197.163-018

OCCUPATIONAL TASK: Plotting and charting ship course

OCCUPATIONAL COMPETENCY: Following charted course

RESOURCES and/or MATERIALS

1. Pencil
2. Metric ruler
3. Protractor
4. Information Sheet
5. Worksheet A
6. Student Attitude Sheet

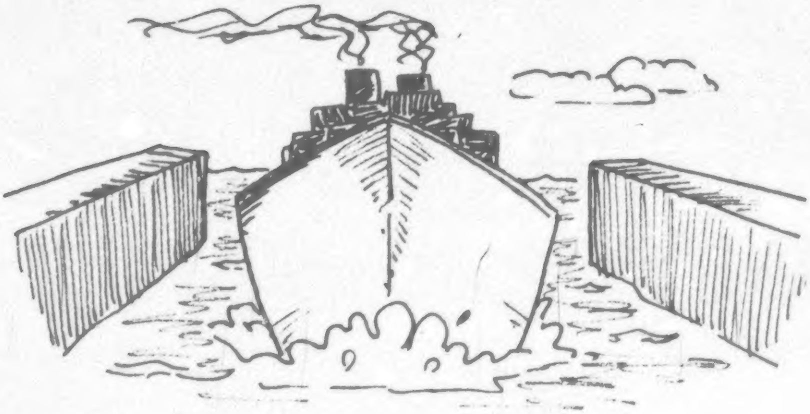
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Understand how to move from one location to another by following specific directions and by using specified instruments.
2. Understand the basic principle of navigation.

LEARNING ACTIVITIES

1. Read Information Sheet.
2. Use Information Sheet to complete Worksheet A.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Meeting the conditions outlined in Numbers 4 and 7 on Information Sheet.
2. Completing Student Attitude Sheet.

INFORMATION SHEET

Instructions for completing Worksheet A are as follows:

1. Mark point A 900 km from Port Home in a straight line with point B. Draw a line connecting Port Home with point A. This line represents the first leg of your voyage.

2. The second leg of your journey proceeds in a southeasterly direction for 525 km and at an angle of 155 degrees off the line of your first leg. Draw a line representing this part of your journey.

3. Continuing your voyage to the southwest you will sail at a 90-degree angle off the second leg and proceed for 675 km. Draw a line representing this third leg of your journey.

4. Let's check your progress. On the borders of your chart locate points 1 and 2. Draw a line connecting them. Now locate points 3 and 4. Draw a line connecting these points. The third part of your journey should have ended where these two check lines crossed. Are you where you should be? If so, continue on course. If not, make the necessary corrections.

5. Draw a line representing the fourth leg of your voyage by sailing in a northwesterly direction and at an angle of 100 degrees off leg three. This portion of your journey is 525 km.

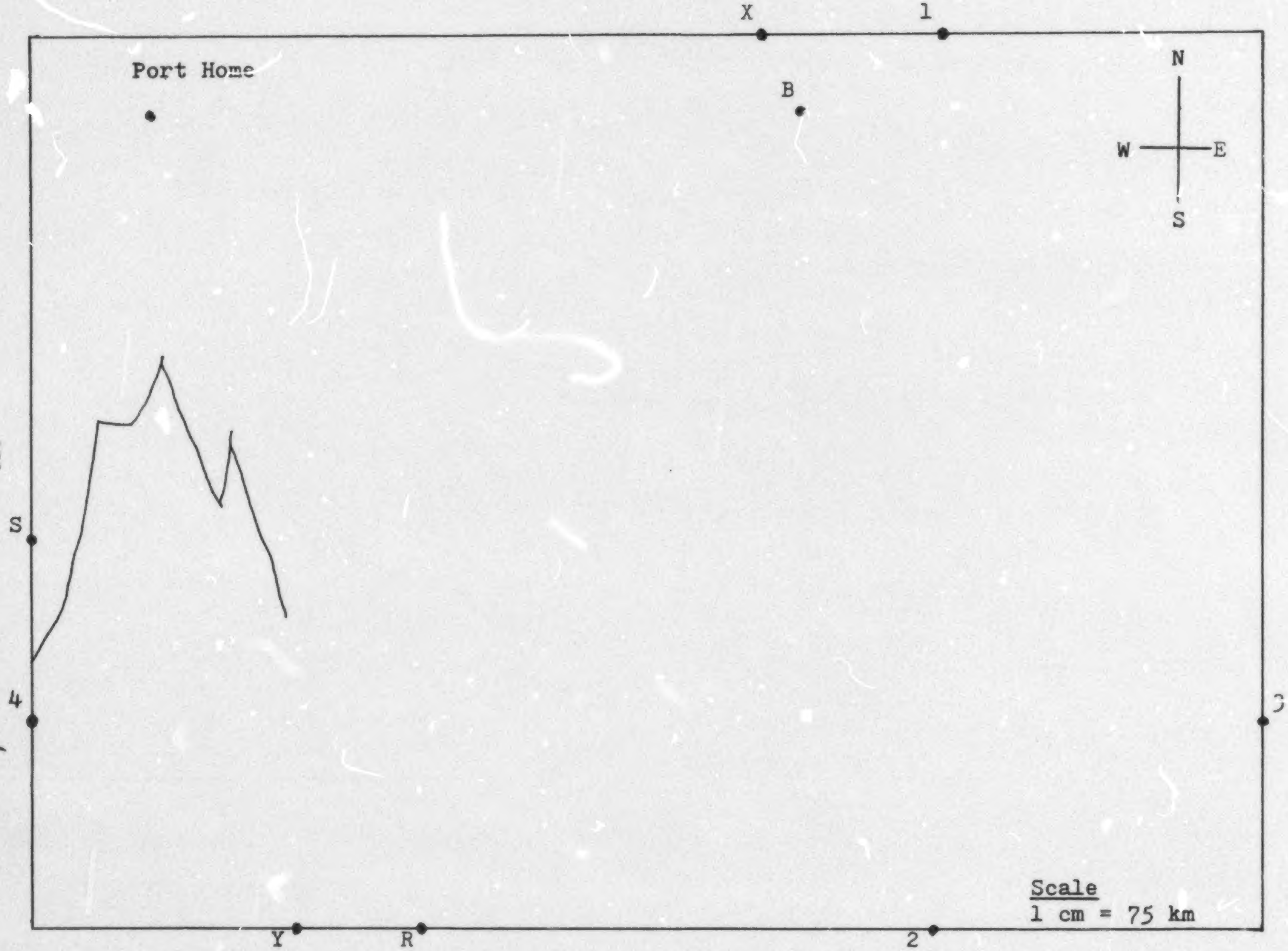
6. Set course now in a southwesterly direction and sail for 450 km at an angle of 120 degrees off leg four.

7. Let's check again. Draw a line connecting marginal points X and Y. Also connect marginal points R and S. If you are not very close to where these lines cross, then someone is in troubled waters. If you are correct, continue on course.

8. To avoid Danger Rock you must now set course at a 45-degree angle off the last leg of your voyage and sail to the north for 750 km. Draw a line representing this leg.

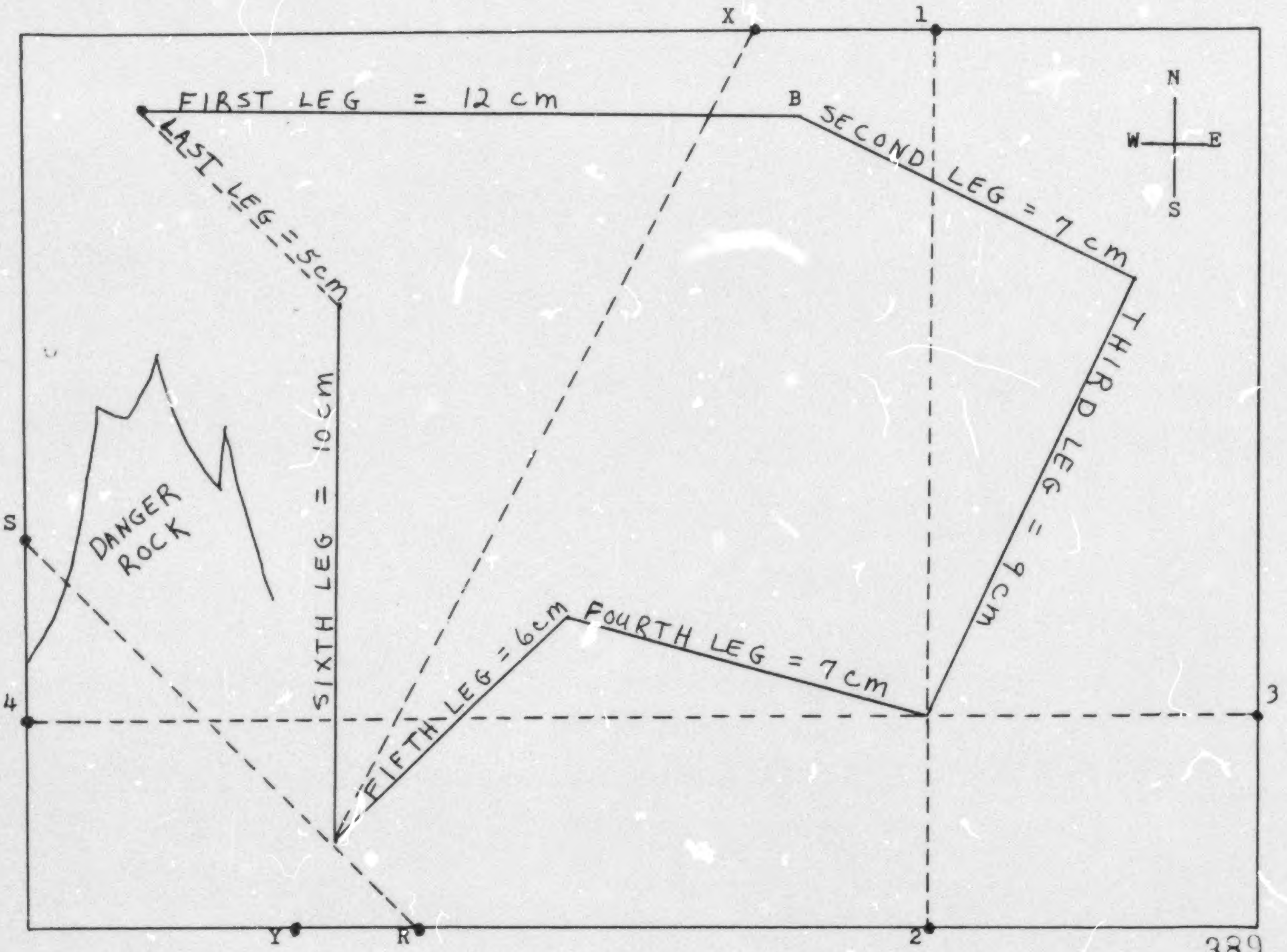
9. If you have navigated well, you should now be 375 km from Port Home.

WORKSHEET A


X
1
Port Home
B
N
W
E
S
S
4
3
Y
R
2

Scale
1 cm = 75 km

WORKSHEET A - KEY


X
1
FIRST LEG = 12 cm
B
SECOND LEG = 7 cm
N
W
E
S
LAST LEG = 5cm
SIXTH LEG = 10cm
DANGER ROCK
THIRD LEG = 9cm
FIFTH LEG = 6cm
FOURTH LEG = 7cm
S
4
3
Y
R
2

Name ______________________________

Occupational Cluster Marine/Fresh Water - Pilot, Ship

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Using protractor					
Simulated voyage					
Computing distance to scale					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Riverboat Captain **DOT CODE:** 197.163-018

DUTIES:

This employed person commands the riverboat to transport passengers, freight, or other cargo along rivers. S/He determines the course and speed of the riverboat on the basis of the available knowledge of winds, weather, tides, and current.

The captain steers the riverboat or orders a crew worker at the helm to steer the riverboat and navigates the boat to avoid reefs, outlying shoals, and other hazards to shipping. In order to do this task successfully, s/he utilizes aids to navigation, such as lighthouses and buoys. This employee inspects the riverboat to insure that the passengers and crew observe regulations pertaining to safe and efficient operation of the riverboat.

Whenever necessary, the riverboat captain relinquishes the command of the riverboat to a PILOT, SHIP (water transportation) to guide the riverboat through hazardous waters. Lastly, a riverboat captain is responsible for maintaining the riverboat's log.

WHERE EMPLOYED:

Persons qualified to work as riverboat captains may become employed by private businesses involved in water vessel operations.

EMPLOYMENT OUTLOOK:

During the 1980's, the employment outlook for riverboat captains is somewhat limited. Competition for the fewer positions is expected to be very keen. Opportunities are expected to occur as a result of persons who retire, die, or change occupations.

EDUCATION AND TRAINING: Aspirants should acquire at least a high school education. Two years of college in business administration would be a tremendous asset. Involvement in courses pertaining to developing good public relations, advertising, planning, personnel development, ways for recruiting personnel, banking, and handling contracts include areas which may prove very helpful when working as a riverboat captain.

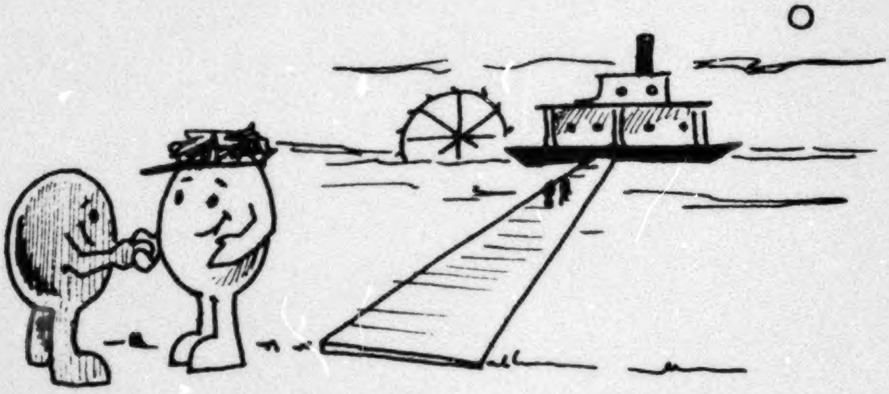
Upon completion of four years of service, an employee would be eligible to sit for an examination for the lowest grade license. The four-years-work experiences should consist of three years on a deck and one year as a pilot.

SPECIAL QUALIFICATIONS: Riverboat captains must be licensed by the U.S. Coast Guard for steam or motor riverboat according to waters navigated and tonnage of the riverboat. S/He must also be licensed as a radio operator. It is imperative that the captain have patience, a pleasing personality, and be able to work and get along well with people.

EARNINGS AND ADDITIONAL BENEFITS: The earnings and additional benefits for a riverboat captain are dependent upon the agreement between the employer and the employee. Ninety per cent of these workers on riverboats are hourly paid employees.

WORKING CONDITIONS AND LIFESTYLES: As a rule, the captain of a riverboat can expect to have favorable working conditions. Most of the time on larger riverboats, the living facilities are comfortable with nutritious meals served to complement the trip made on the boat.

From time to time, this worker is forced to work under adverse weather conditions which may prove to be uncomfortable. Also, employers may schedule captains to work various hours - 30 days on the job and then 30 days off, or split shifts consisting of six hours on and six hours off. Consequently, captains may have to be away from home for extended periods of time and work longer shifts when on duty. Working on a split shift may require a worker to be on duty during the late shift at night.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

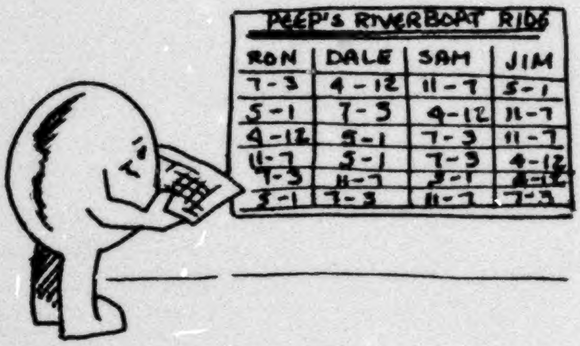
REPRESENTATIVE JOB TITLES:		
	Riverboat Captain	197.163-018
	Barge Captain	197.163-014
	Ferryboat Captain	197.163-010

OCCUPATIONAL TASK: Becoming familiar with riverboat captains' responsibilities

OCCUPATIONAL COMPETENCY: Preparing work schedules for crew

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A - 15 LONGEST RIVERS IN THE WORLD
3. Information Sheet B - PARTS OF A RIVER
4. ACTIVITY SHEET I - WORK SCHEDULES
5. Student Attitude Sheet



PEEP'S RIVERBOAT RIDE

RON	DALE	SAM	JIM
7-3	4-12	11-7	5-1
5-1	7-3	4-12	11-7
4-12	5-1	7-3	11-7
11-7	5-1	7-3	4-12
7-3	11-7	5-1	4-12
5-1	7-3	11-7	7-3

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Discuss some of the longest rivers in the world.
2. Appreciate riverboat captains' contribution to our society.
3. Realize more the influences which rivers have made on mankind.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Review Information Sheet A - 15 LONGEST RIVERS IN THE WORLD.
3. Discuss Information Sheet B - PARTS OF A RIVER.
4. Complete ACTIVITY SHEET I - WORK SCHEDULES.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Reading and discussing Information Sheets A and B.
3. Completing and submitting ACTIVITY SHEET I - WORK SCHEDULES to the teacher.
4. Complete the Student Attitude Sheet.

INFORMATION SHEET A

15 LONGEST RIVERS IN THE WORLD

	NAME	PLACE	MILES (App. Length)
1.	NILE	(East-Central Africa)	4,160
2.	AMAZON	(South America)	3,900
3.	YANGTZE	(Asia)	3,100
4.	CONGO	(Africa)	2,718
5.	MISSOURI	(North America)	2,714
6.	AMUR	(Asia)	2,700
7.	HWANG HO	(Asia)	2,700
8.	LENA	(Asia)	2,645
9.	MEKONG	(Asia)	2,600
10.	NIGER	(Africa)	2,600
11.	MACKENZIE	(North America)	2,514
12.	OB	(Asia)	2,500
13.	PARANA'	(South America)	2,450
14.	YENISEY	(Asia)	2,360
15.	MISSISSIPPI	(North America)	2,350

INFORMATION SHEET B

PARTS OF A RIVER

1. BED - Bottom of the channel which is lower than the country on either side

2. BANKS - Sides of the river

3. RIGHT BANK - View on the right hand side when you are looking downstream

4. LEFT BANK - View on the left hand side when you are looking downstream

5. TRIBUTARIES - Branches leading to a river

6. RIVER SYSTEM - A river and all of its branches

7. DISTRIBUTARY - River branch flowing out of the main stream and not rejoining it

8. RIVER BASIC - Area which a river system drains

9. DIVIDES - Ridges on heights of land which separate rivers and river systems

10. GRADIENT - The slope

11. UPPER COURSE - Part of river where slope is steep, and the current is swift

12. MIDDLE COURSE - Part of river of lower lands where the slope is more gentle

13. LOWER COURSE - Part of the river which is only a little different from the middle course. The current is somewhat slower. The slope now is only a few inches a mile. The river often overflows the low banks and forms wide flood plains.

14. DELTA - An alluvial plain which has been formed by a river flowing slowly into an arm of the sea and dropping its silt at its mouth and building up land.

15. NAVIGABLE RIVERS - Rivers wide and deep enough for large boats

ACTIVITY SHEET I

WORK SCHEDULES

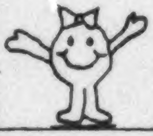
Pretend that you have recently become employed as captain of PEEP'S RIVERBOAT in Anyplace, West Virginia. Prepare a schedule for work activities to be completed by each member of your three-member crew. For example, cleaning, maintaining equipment, selling light refreshments and souvenirs, and observing passengers (ages 3 months - 80 years of age) that they are all obeying safety regulations. Your riverboat should be a three-hour water tour of the Ohio River.

Name ____________________

Occupational Cluster Marine/Fresh Water - Riverboat Captain

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading the Career Information Sheet pertaining to a riverboat captain					
Reviewing the 15 LONGEST RIVERS IN THE WORLD					
Reading and discussing the PARTS OF A RIVER					
Preparing work schedules for a crew					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ____________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Scuba Diver DOT CODE: 379.384-010

DUTIES:

A scuba diver performs various underwater jobs. S/He wears diving gear, such as a self-contained underwater breathing apparatus, mask, flippers, and insulated suit.

During a regular routine of work, this employee swims from a boat, dock, or shore to a jobsite. After reaching the location of the jobsite, the scuba diver dives down into the water to locate or recover submerged automobiles, boats, logs, and articles, such as purses, keys, and other valuables.

It may be necessary to swim to the bottom of water depth and fasten a line or chain around heavy objects and attach to a hook which has been lowered to assist in raising the object out of the water. S/He may pick up and carry smaller objects to the surface.

Being employed as a scuba diver may provide many varied opportunities such as searching for bodies of people who have experienced death; fishing for abalones, crabs, or sponges; repairing underwater installations; and/or investigating devices by using safety line and communicating with tender by jerking on line.

WHERE EMPLOYED:

Divers may become employed by marine industrial and construction firms in underwater welding; underwater pipefitting; building bridges and docks; and in underwater salvage. Diving is used as a research aid in Fish and Game divisions and Fish and Wildlife agencies which study and protect marine fauna and flora.

Navy scientific and research facilities employ divers. Quite often overseas construction projects require divers. Oil firms doing offshore drilling also include divers among their full-time employees.

EMPLOYMENT OUTLOOK: The need for divers is expected to continue to increase in industrial fields. International agencies are turning their attention to the seas for untapped sources of food supplies and minerals. The sea is expected to become a major source of fresh water for some areas as desalinization processes improve. All these industrial developments will require divers in their construction and maintenance.

EDUCATION AND TRAINING: A high school education is highly recommended. Although a lot can be learned about the work by starting as diver tenders, diving school is recommended. The regular training course can be completed in five weeks. This training includes all diving methods, hard hat, skin, and scuba. The trainee is expected to spend some time as a diver tender after graduation.

Persons interested in diving should acquire an industrial skill such as construction, welding, photography, or ship repair so that they will be employable.

SPECIAL QUALIFICATIONS: A person aspiring to become a scuba diver must have excellent health and physical strength. S/He must have the ability to adapt quickly to emergency situations, be able to work on their own with a minimum of supervision, and face unexpected circumstances without panicking.

EARNINGS AND ADDITIONAL BENEFITS:

Earnings for a commercial diver vary according to working conditions and the depth to which s/he dives. Divers who obtain steady work can expect to earn $15,000 to $20,000 a year.

Graduated premiums may be added for depth of work and for work in tunnels or pipes. Fox example, premium pay rates may begin with $1 per foot per day for every foot descended below 50 feet down to 100 feet and increase with increasing depth. Scuba divers can go down 200 feet and over 200 feet is work for a hard hat.

Depending upon the employer, fringe benefits will vary. However, most divers have some type of medical and life insurances and dental benefits.

WORKING CONDITIONS AND LIFESTYLES:

The work is completed in water at varying depths. The hours of those working in this field are unstable. The working hours vary according to the need. This is a very hazardous kind of work.

The jobs are usually temporary as the work is intermittent. The water may be very cold, uncomfortable, accompanied by breathing limitations, physical exertion, and strain. Injuries or health conditions cause many persons employed as divers to change their occupation to one that is less demanding.

Divers may have to be absent from their homes and families because of extended periods of work.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

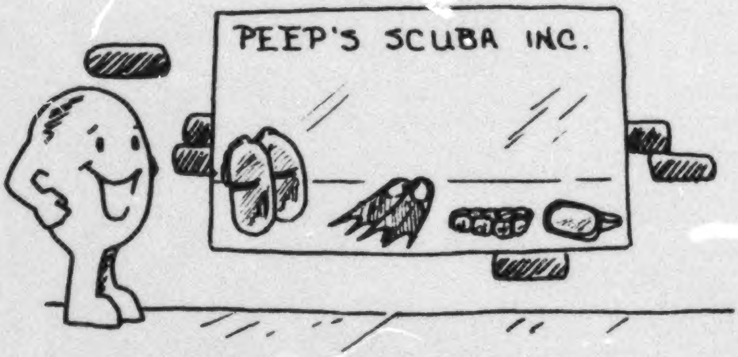
OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Scuba Diver	379.384-010
Lifeguard	379.667-014
Diver, Submarine Worker	899.261-010

OCCUPATIONAL TASK: Exploring free enterprise

OCCUPATIONAL COMPETENCY: Planning a small scuba dive shop


PEEP'S SCUBA INC.

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A
3. Activity Sheet A
4. Activity Sheet B
5. Student Attitude Sheet

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of the necessary qualifications and aptitudes for the job.
2. Determine some prospects for success and satisfaction when working as a scuba diver.
3. Become stimulated to do further research into related jobs within the Marine/Fresh Water Cluster.

LEARNING ACTIVITIES

1. Become knowledgeable of all parts of the Career Information Sheet pertaining to scuba diver.
2. Read Information Sheet A.
3. Complete Activity Sheet A.
4. Complete Activity Sheet B.
5. Complete the Student Attitude Sheet.

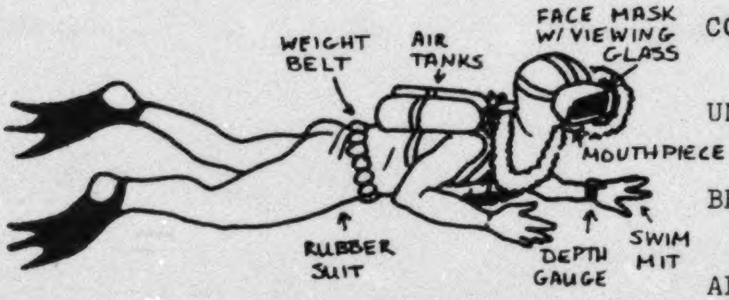
EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Reading Information Sheet A.
3. Completing Activity Sheet A.
4. Completing Activity Sheet B.
5. Completing the Student Attitude Sheet.

Information Sheet A

SCUBA stands for SELF-



CONTAINED

UNDERWATER

BREATHING

APPARATUS

which describes the air tanks that are worn on the diver's back. A standard SCUBA tank is capable of holding 2,250 pounds of compressed air per square inch. A regulator is used to reduce the pressure of this highly compressed air in the tank and deliver it to the diver at the same water-depth pressure in which s/he is swimming. It is easily understood that this type of diving can be very dangerous and tiring work.

You may be surprised to learn that diving-related industries make and sell products that gross over 100 million dollars per year. Also, you just may become employed in one of the 20,000 full-time positions associated with diving.

Already, there are 1300+ dive shops in these United States. Many of the salespersons employed at the dive shops also teach courses pertaining to diving, organize dive trips, and assist customers in selecting proper equipment for safe scuba diving as a recreational activity.

Activity Sheet A

Upon graduation from high school and completion of a 12-week diving instructor's school, you have decided to go into business for yourself. You are planning to operate a small scuba dive shop. Complete the following activities.

1. In 25 words or less, state your plans for obtaining $15,000 for supplies and/or equipment to stock the dive shop.

2. Identify the kind of building you plan to use and the location of a body of water where courses in diving may be offered by you.

3. Name your new business.

____

4. Compile a list of items which you plan to have in your dive shop for the "Grand Opening Day."

A. ______________________________

B. ______________________________

C. ______________________________

D. ______________________________

E. ______________________________

F. ______________________________

G. ______________________________

H. ______________________________

I. ______________________________

J. ______________________________

K. ______________________________

L. ______________________________

Activity Sheet A - Key

1. Suggested ways for obtaining $15,000 for supplies and/or equipment.

    a. Borrow some of the money from local bank

    b. Try to negotiate for some supplies and/or equipment to be on consignment

    c. Borrow part of the money from parents, grandparents, and/or other relatives with an agreed-upon interest to be paid by you

    d. Part of the money could come from own savings

    e. Form a partnership or corporation where other people will be helping with supplying the money and assisting in operating the business

2. Suggestion: One large, spacious room with adjoining restroom facility near a pond, lake, swimming pool, river, or ocean.

3. Suggestion for name - Divers' Treasure Shop

4. Suggestions:

A. fins

B. face masks

C. wet suits

D. underwater cameras

E. snorkels

F. camera housings

G. buoyancy compensators

H. dry suits

I. swim mits

J. air tanks

K. depth gauges

L. weight belts

Activity Sheet B

A high school diploma can be a tremendous accomplishment providing that the recipient has really applied him/herself during the 12 years of formal training. Choose a course offered in the public school that may help you more in becoming prepared to perform in the following ways:

Example: English 0. Communicating with people

____________ 1. Selling equipment to customers

____________ 2. Renting and maintaining dive gear

____________ 3. Teaching courses in diving

____________ 4. Organizing diving trips

____________ 5. Writing orders for supplies

____________ 6. Checking stock on hand

____________ 7. Filling telephone orders

____________ 8. Ordering new merchandise

____________ 9. Studying manufacturers' catalogs

____________10. Repairing equipment

____________11. Inspecting tanks for rust and structural weaknesses

____________12. Loading heavy tanks on to a truck in preparation for a diving trip

____________13. Learning about new products

____________14. Attending seminars offered by diving gear manufacturers for demonstrations of new products and their maintenance

____________15. Comparing prices in order to determine the best product at a lesser price

Activity Sheet B - Key

1. English (Using correct English while speaking to all people is very important.)

2. English and power mechanics
(Talking with people, writing neatly and legibly, and having knowledge in basic mechanics.)

3. English (Speaking correctly, being able to give directions, and evaluating written assignments.)

4. English (Proper telephone techniques, writing effective communications.)

5. English and Mathematics
(Good penmanship, correct mathematical computations.)

6. English (Reading) - (Being able to read well.)

7. English and Shorthand
(Good listening techniques, good handwriting; shorthand will help with the speed in taking the orders.)

8. English (Good handwriting and/or manners over the telephone.)

9. English and Literature
(Being able to read well; read the small print as well as the large print.)

10. Prevocational Exploration, Power Mechanics, and other shop courses (Being able to handle tools and equipment found in shops.)

11. Power Mechanics and other shop courses
(Being able to detect faulty equipment.)

12. Physical Education
(Strong bodies are needed in lifting heavy equipment.)

13. English (Listening skills, good reading ability.)

14. English (Listening skills, dressing appropriately.)

15. Mathematics (Being able to compute discounts, etc.)

Name ______________________________

Occupational Cluster Marine/Fresh Water - Scuba Diver

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with Career Information Sheet					
Planning to operate a small scuba dive shop					
Identifying courses in high school that will help you in operating a dive shop					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Ship Purser

DOT CODE: 197.167-014

DUTIES:

The ship's purser coordinates the activities of workers aboard ship concerned with shipboard business functions and social activities for passengers. This includes preparing shipping articles and signing on the crew. The purser maintains payroll records and pays off crews upon the completion of the voyage. The officer may be called on to cash travelers' checks and exchange money for foreign currencies. The purser receives all cash receipts and accounts for them at the end of the trip.

The ship's purser prepares official shipping articles, or papers, and submits passenger and crew sailing lists to governmental agencies as required by regulations. Preparing the ship's entrance and clearance papers for foreign ports and preparing the papers necessary for discharging cargo are among the duties.

One of the most important functions of the office is to act as the main information center for both passengers and crew. S/He may arrange for travel and scenic tours at ports of call, provide banking services and safekeeping of valuables for passengers, and/or plan and conduct games, tournaments, and parties for passengers' enjoyment. In addition to these responsibilities, the purser may conduct religious services and any first aid for passengers.

WHERE EMPLOYED:

Pursers may work on a ship, ocean liner, freighter, or tanker and serve as ship's clerks.

EMPLOYMENT OUTLOOK:

The employment outlook through the 1980's is expected to be declining and there will be keen competition for the existing openings. Some openings may occur because of people who die, retire, or change to other occupations.

EDUCATION AND TRAINING:

Business courses in high school, such as bookkeeping and typing, can help prepare persons to work as pursers. Advanced instruction available at business schools, practical business experience, and a knowledge of ship's operation accounting are assets.

Beginning pursers may have to pass examinations. A requirement of having had sea experience includes six months for a senior assistant purser, one year for purser, and two years for chief purser. Persons going to sea for the first time may be required to obtain merchant mariners' documents from the U.S. Coast Guard.

SPECIAL QUALIFICATIONS:

A person aspiring to work as a purser needs much vitality and a fairly rugged constitution. S/He should have a pleasing voice, good manners, and a warm sincere interest in helping people. Neatness of appearance is imperative. This employee should always be able to exercise tact and discretion when answering questions of passengers. S/He must be relaxed and be a pleasant person when around passengers.

EARNINGS AND ADDITIONAL BENEFITS:

Earnings and fringe benefits vary according to the size of the vessel on which the purser is working. On the average, pursers receive $800 a month base pay. Pursers on larger vessels may expect salaries ranging from $14,000 to $20,000 per year. In addition to a good salary, the purser is entitled to a free private room which is cleaned by a steward, and free meals in the dining hall with the other officers.

Generally the purser gets comprehensive medical care and 90 to 180 days of vacation yearly.

WORKING CONDITIONS AND LIFESTYLES:

As a rule, the work is clean and pleasant, with comfortable surroundings. The ship's purser wears the three gold stripes of a staff officer and is provided living quarters.

The size and nature of the ship usually determine the number of pursers and the duties they perform. These workers may be away from home for extended periods of time. S/He may be on call 24 hours a day. It is not unusual for pursers to stay up very late at night with passengers who are having a very good time partying.

Time off from work consists of the few days between sailings and yearly vacations, or, for those pursers working on weekly cruise ships, six months on constant duty followed by three months' shore leave.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Ship Purser	197.167-014
Master, Ship	197.167-010
Tugboat Mate	197.133-034
Dredge Mate	197.137-010

OCCUPATIONAL TASK: Exploring the responsibilities of a ship purser

OCCUPATIONAL COMPETENCY: Maintaining payroll records

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Activity Sheet A
3. Student Attitude Sheets

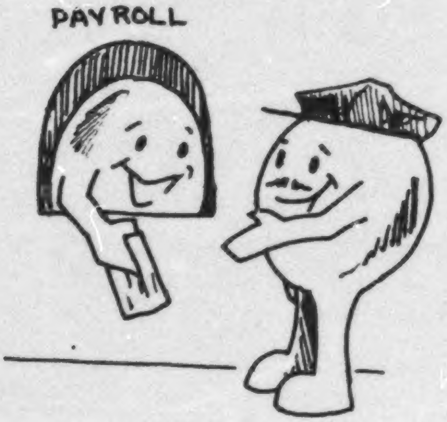
LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Recognize a ship purser as a necessary member of the crew aboard ship.
2. Discuss the advantages and disadvantages when working as a ship purser.
3. Determine if you want to learn more about the possibility for earning your livelihood as a purser.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet printed material.
2. Complete Activity Sheet A.
3. Check answers for Activity Sheet A.
4. Complete the Student Attitude Sheet.



EVALUATION PROCEDURES

Your evaluation will consist of:

1. Listening attentively to the Career Information Sheet material pertaining to ship purser.
2. Completing Activity Sheet A.
3. Completing the Student Attitude Sheet.

Activity Sheet A

Payroll data must be accumulated by business enterprises, nonprofit enterprises, and governmental agencies. The most obvious use of such information is in determining the amount owed to employees on payday. The need and the manner of use vary with the types of activity in which the employee is engaged and the nature of the employer's operations.

The earnings of employees may be based on time worked, sales volume, or some other criterion of productivity. The measure most frequently employed is time, and the remuneration is usually stated as a rate per hour, day, week, month, or year.

When a remuneration is based on time, it is necessary to maintain a record of the time worked by each employee.

Activity One:

Choose 10 students in your Prevocational Exploration class to accompany you as paid employees on a one-week ocean trip. Substitute class members names for the alphabet letters. Prepare the payroll register for one week.

These workers are to be paid on an hourly basis, receiving time-and-one-half pay for all hours worked in excess of 40 a week. The record of time worked for the week ended Saturday, ________________, of the current year, together with
(Supply last Saturday's date)
other relevant information is summarized below:

Timekeeper - Ship Purser PEEP

Names	Total Hours	Hourly Rate	Income Tax Withheld	Bond Deducions	Cumulative Earnings, March 24
A. ____________	40	5.25	15.75	3.50	$2,908
B. ____________	37	5.00	8.30	7.00	2,520
C. ____________	43	6.00	12.80	3.50	3,960
D. ____________	32	6.50	8.20	--	3,500
E. ____________	40	7.00	11.50	3.50	5,280
F. ____________	40	7.00	13.90	3.50	3,000
G. ____________	44	7.00	15.90	7.00	4,200
H. ____________	41	5.00	10.40	3.50	5,560
I. ____________	43	5.25	12.20	3.50	3,780
J. ____________	32	6.50	8.20	3.50	3,250
TOTAL					

Activity Sheet A (continued)

Compute the total hours, income tax withheld, bond deductions, and cumulative earnings as of March 24.

Prepare the payroll register for the week, using the same total hours and hourly rates. FICA should be calculated at 6.7 percent.

		Earnings			Deductions		Paid
Name	Total Hours	Regular	Overtime	Total	FICA	Federal Income Tax	Net Amount
A.						$26.97	
B.						22.22	
C.						37.80	
D.						26.59	
E.						40.45	
F.						40.45	
G.						50.95	
H.						26.40	
I.						31.46	
J.						[illegible]6.59	

Activity Sheet A Key

Part I

Names of classmates should be placed in blank spaces beside alphabet letters A - J.

	Total Hours	Income Tax Withheld	Bond Deductions	Cumulative Earnings
Totals	392	$117.15	38.50	$37,958.

Part II

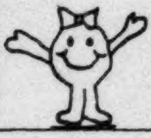
		Earnings			Deductions			Paid
Name	Total Hours	Regular	Overtime	Total	FICA	Federal Income Tax	Bond Deductions	Net Amount
A.	40	$210.		$210.	$14.07	$26.97	$3.50	$165.46
B.	37	185.		185.	12.40	22.22	7.00	143.38
C.	43	240.	$27.	267.	17.89	37.80	3.50	207.81
D.	32	208.		208.	13.94	26.59	--	167.47
E.	40	280.		280.	18.76	40.45	3.50	217.29
F.	40	280.		280.	18.76	40.45	3.50	217.29
G.	44	280.	42.	322.	21.57	50.95	7.00	242.48
H.	41	200.	7.50	207.50	13.90	26.40	3.50	163.70
I.	43	210.	23.63	233.63	15.65	31.46	3.50	183.02
J.	32	208.		208.	13.94	26.59	3.50	163.97
TOTALS	392	$2301.	$100.13	$2401.13	$160.88	$329.88	$38.50	$1871.87

Name ______________________________

Occupational Cluster Marine/Fresh Water - Ship Purser

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Becoming familiar with Career Information Sheet pertaining to ship purser					
Completing payroll record for 10 employees aboard ship					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

CAREER INFORMATION SHEET

JOB TITLE: Shipfitter (Shipyard Worker) **DOT CODE:** 806.381-046

DUTIES:

Persons working as shipfitters lay out and fabricate metal structural parts, such as plates, bulkheads, and frames, and brace them in position within the hull of the ship for riveting or welding. They lay out position of parts on metal, working from blueprints or templates and using scribe and handtools.

Shipfitters locate and mark reference lines, such as center, buttock, and frame lines. They position parts in the hull of the ship, assisted by a rigger. These workers aline parts in relation to each other, using jacks, turnbuckles, clips, wedges, and mauls. They mark the locations of holes to be drilled and install temporary fasteners to hold the parts in place for welding or riveting. This work also involves their installing packing, gaskets, linens, and structural accessories and members, such as doors, hatches, brackets, and clips.

Persons working in this capacity may prepare molds and templates for fabrication of nonstandard parts. They may tack weld clips and brackets in place prior to permanent welding. Lastly, shipfitters may roll, bend, flange, cut, and shape plates, beams, and other heavy metal parts, using shop machinery, such as plate rolls, presses, bending brakes, and joggle machines.

WHERE EMPLOYED:

These workers are employed by companies whose business pertains to making and/or repairing ships. A shipyard is a large area with many sheds and piers. Close to the water there are great wood-and-steel frameworks, called dry docks, in which the ships are made.

EMPLOYMENT OUTLOOK:

The shipbuilding business is sometimes more favorable and sometimes less favorable. At the present time, American builders are making fewer ships than they have in previous years. Opportunities for employment as shipfitters are expected to occur as a result of workers who die, retire, or change occupations.

EDUCATION AND TRAINING:

Persons who aspire to work for shipyards should definitely plan to complete high school. Students should take advantage of courses in shop, manual training courses, and drafting during the high school program. Subjects like math and hygiene, too, may prove helpful on the job. Physical education courses and participation in various sports may help to build a strong body.

Some states offer apprenticeship programs that should be investigated for possibilities toward enrolling.

SPECIAL QUALIFICATIONS:

Among the needed special qualifications for a shipfitter, we find that being able to work well with your hands is important. This employee also must be very strong and not be afraid of heights.

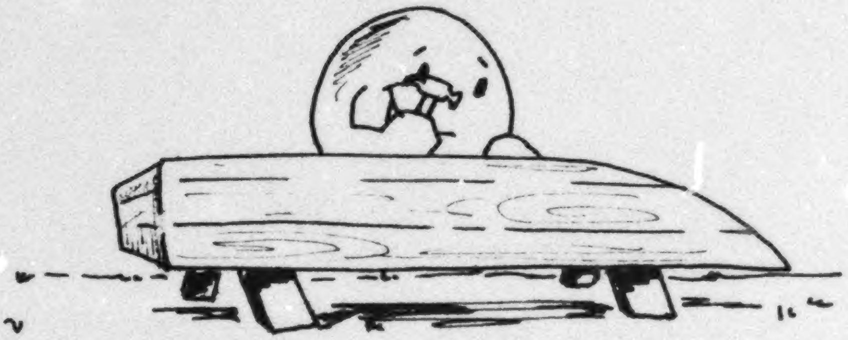
EARNINGS AND ADDITIONAL BENEFITS:

Earnings for shipfitters will vary according to the place of employment and the amount of experience. However, the starting pay for some shipyard workers is about $6 or $7 an hour. Additional benefits may include holidays off from work with pay, vacations with pay, and several kinds of insurance programs.

WORKING CONDITIONS AND LIFESTYLES:

Persons employed as shipfitters may be required to work outside most of the time. Since shipyards are busy places all year long, this job is full-time during all seasons. Usually, the work week is 40 hours beginning each day at 8:00 A.M. and ending at 4:30 P.M. Occasionally overtime is necessary, but the worker earns extra pay for the extra hours.

Sometimes the noise, vibration, and fumes may be irritating to an employee. Also, there is a certain amount of risk connected with this job.



ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Shipfitter (Shipyard Worker)	806.381-046
Shipfitter Apprentice	806.381-050
Shipfitter Helper	806.687-050
Boat Repairer	807.371-014

OCCUPATIONAL TASK: Exploring shipfitting

OCCUPATIONAL COMPETENCY: Cutting and placing parts of a ship together

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Information Sheet A - GLOSSARY OF TERMS
3. Transparencies of FAMOUS SHIPS and KINDS OF SHIPS
4. Activity Sheet A - Shipfitter's Puzzle
5. Student Attitude Sheets

LEARNING OBJECTIVES

After completing the learning activities, you should to able to:

1. Become more familiar with parts of a ship.
2. Appreciate people who build American ships even for peace time adventures.
3. Determine if you want to obtain additional information with respect to shipfitting.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Discuss building model ships as a hobby and making and collecting model ships enclosed in narrow-necked bottles.
3. Review the glossary of terms pertaining to a ship - Information Sheet A.
4. Share transparencies of FAMOUS SHIPS and KINDS OF SHIPS with class. Encourage discussion of each item listed.
5. Complete Activity Sheet A - Shipfitter's Puzzle.
6. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participation in class discussion of numbers 2, 3, and 4 in Learning Activities.
3. Completing Activity Sheet A - Shipfitter's Puzzle.
4. Completing and submitting the Student Attitude Sheet to the teacher.

INFORMATION SHEET A

Glossary of Terms

1. Aft. Situated near or at the stern of a vessel.
2. Aloft. Above the main deck of a vessel.
3. Beam. The widest point on a ship's hull.
4. Bilge. The lowest part of a ship's hull.
5. Bridge. A crosswise platform above the main deck of a ship from which the ship is controlled.
6. Bulkhead. A wall or partition separating rooms, holds, or tanks.
7. Bunkers. The compartment in which coal is stowed.
8. Chain Locker. The compartment in the forward part of the ship where the anchor chain is stored.
9. Cradle. Part of the ship's frame which holds booms when they are lowered.
10. Draft. The distance from a ship's keel to the water line.
11. Flare. The outward curve of a ship's side from the water line to deck level.
12. Forecastle. The upper deck forward of the foremast. It is also a section in the bow where the crew lives.
13. Forward. The fore part of a ship.
14. Galley. The ship's kitchen.
15. Gunwale. The upper edge of a ship's or boat's side.
16. Hatch. An opening in a ship's deck for handling cargo.
17. Hull. The floating body of a ship.
18. Keel. The timber or bar forming the backbone of the ship, running from the stem to the sternpost at the bottom of the hull.
19. Mooring. Tying a ship to a dock or buoy.

20. **Nautical Bell.** Time is kept aboard ship by the ringing of bells every half hour.

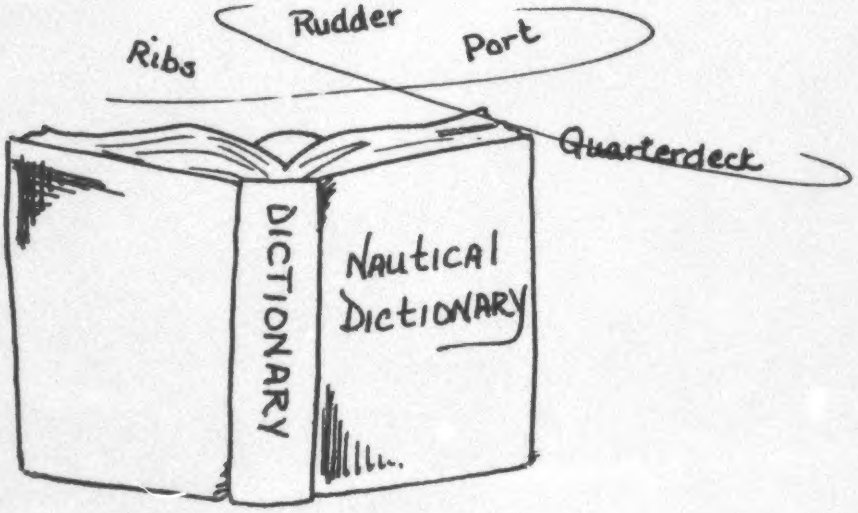
21. **Port.** The lefthand side of a ship looking forward.

22. **Porthole.** An opening in the ship's side, usually round and fitted with glass and metal covers.

23. **Quarterdeck.** That part of the upper deck reserved for officers.

24. **Ribs.** The frame pieces making the side of a ship.

25. **Rudder.** The flat metal or wooden piece fastened to the sternpost by which the ship is steered.


Rudder
Ribs
Port
Quarterdeck
DICTIONARY
Nautical Dictionary

FAMOUS SHIPS

ALABAMA

CLERMONT

CONSTITUTION, THE

FLYING DUTCHMAN

LEVIATHAN

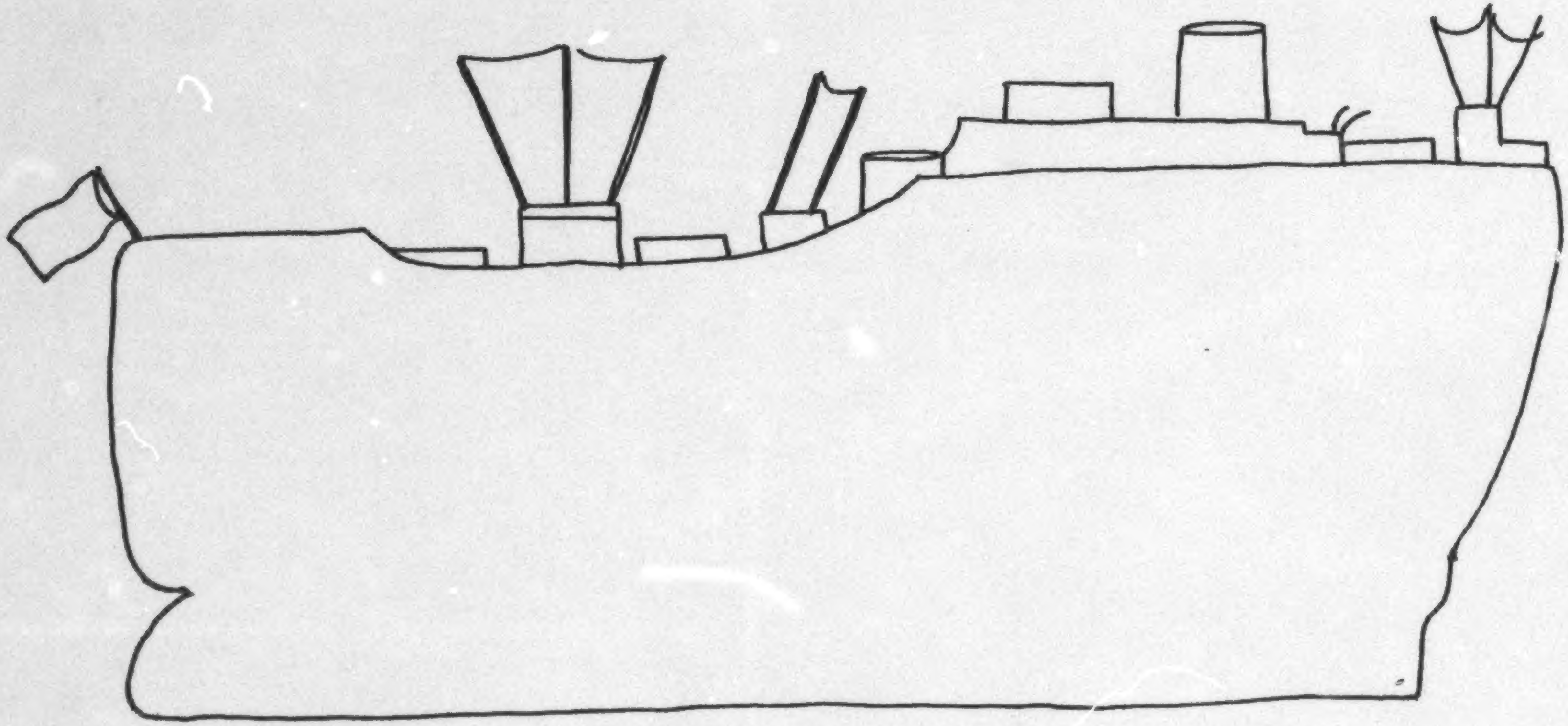
MAINE

SAVANNAH

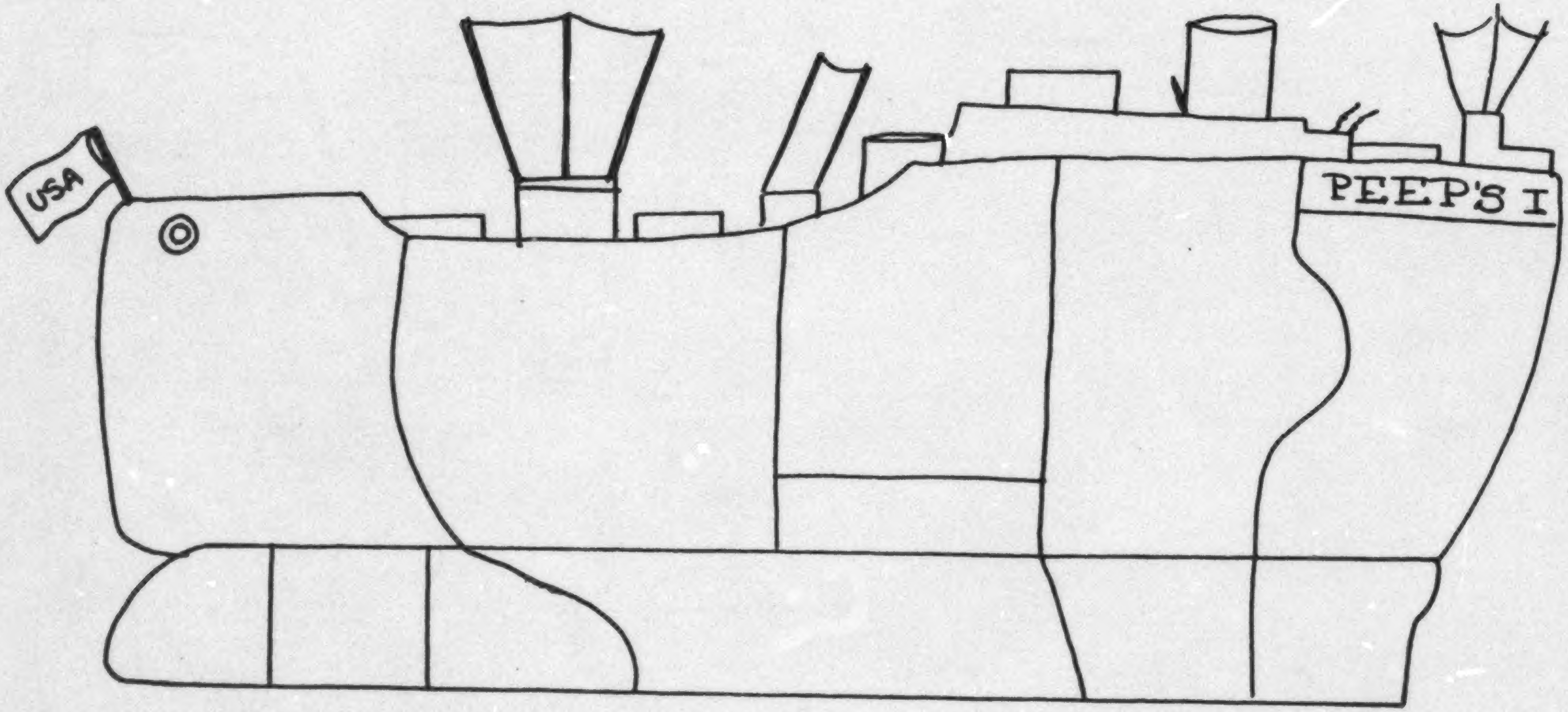
TITANIC

KINDS OF SHIPS

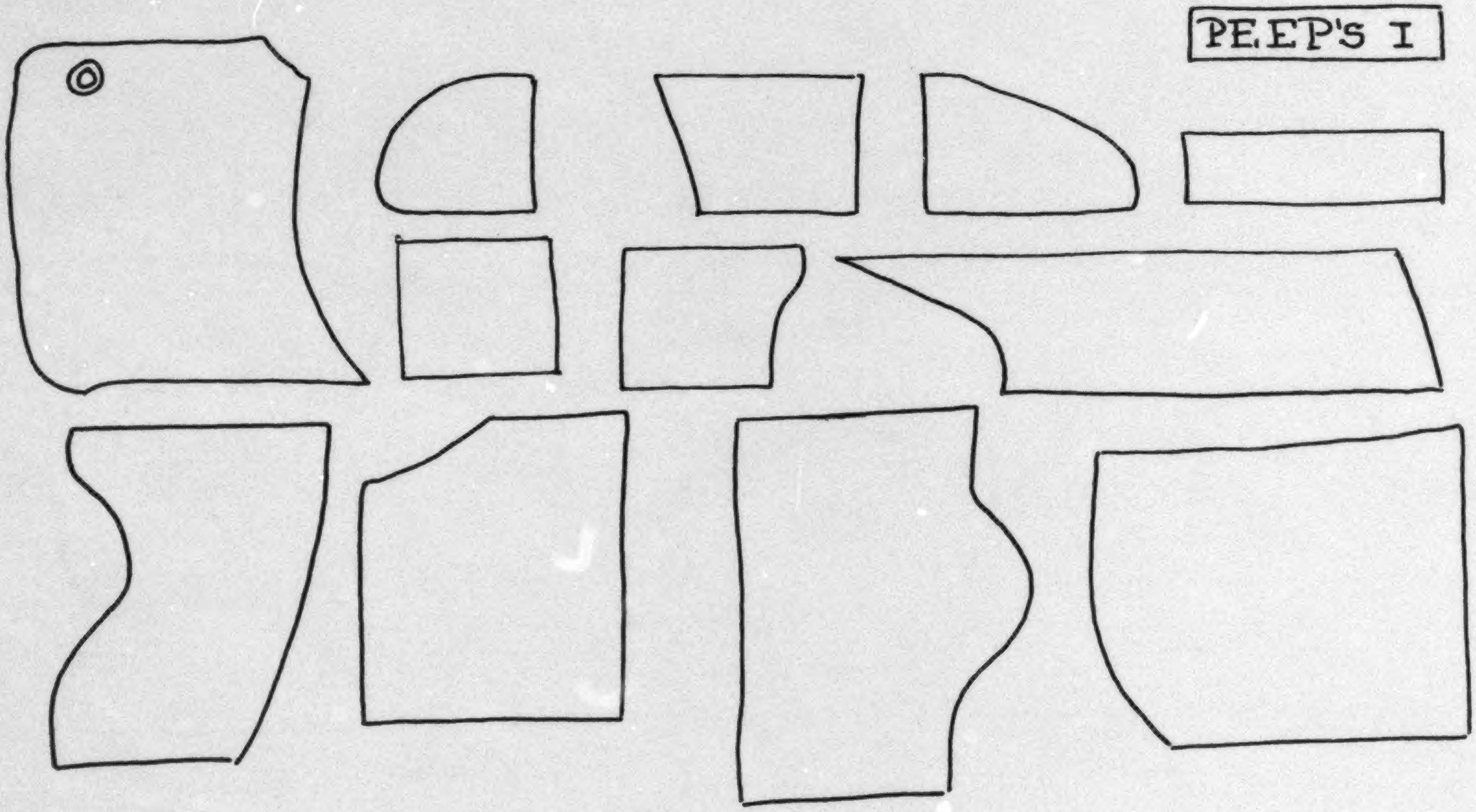
1. BATTLESHIP
2. GALLEON
3. GALLEY
4. ICEBREAKER
5. LANDING CRAFT
6. NAVY
7. ROTOR SHIP
8. SAILING SHIP
9. SHIP, ATOMIC
10. STEAMBOAT
11. TANKER
12. TRAWLER
13. TRIREME



ACTIVITY SHEET A



ACTIVITY SHEET A - KEY



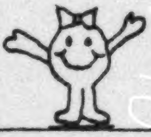
SHIPFITTER'S PUZZLE PARTS

Name ______________________________

Occupational Cluster Marine/Fresh Water - Shipfitter (Shipyard Worker)

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Discussing hobbies pertaining to ships					
Reviewing GLOSSARY OF TERMS pertaining to ships					
Viewing transparencies of FAMOUS SHIPS and KINDS OF SHIPS					
Cutting and placing parts to Shipfitter's Puzzle					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Sportfishing Captain **DOT CODE:** 197.133-010

DUTIES:

A sportfishing captain commands the fishing vessel crew engaged in catching fish. S/He may interview, hire, give instructions to crew, and assign crew to watches and quarters.

The captain plots courses on navigation charts and computes positions, using standard navigation aids, such as compass, sextant, clock, radio fix, and navigation tables. S/He steers the fishing vessel and operates electronic equipment, such as radio, sonic depth finder, and radar. This worker directs fishing operations using knowledge of fishing grounds and workload capacities of vessel and crew.

Other responsibilities include recording daily activities in the ship's log and periodically purchasing supplies and equipment for boat, such as food, fuel, webbing, rope, and cable.

WHERE EMPLOYED:

Sportfishing captains are employed mainly at the large seaports. Captains may become employed by private companies who have boats for business, leisure-time activities, and chartering. S/He may also become self-employed and own her/his own fishing vessel.

EMPLOYED OUTLOOK:

The employment outlook for sportfishing captains is expected to be on a decline. Extensive use of small boats by private individuals has caused a decline in the number of passengers for party boats in recent years.

EDUCATION AND TRAINING: At least a high school education with much concentration in courses pertaining to math is recommended. The knowledge necessary to obtain a required operator's license issued by the Coast Guard includes: use of nautical charts; determining and laying compass courses; International and Inland Rules of the Road; rudimentary seamanship, including the use and construction of a sea anchor; making temporary repairs to the hull in the event of a leak; proper anchoring, mooring, and unmooring procedures; and handling the vessel in heavy weather, etc.

Private businesses offer courses in teaching interested persons how to be captains. Persons aspiring to be a captain should have first served as a mate on a ship.

SPECIAL QUALIFICATIONS: A person aspiring to work as a captain of a sportfishing boat must be familiar with all phases of boat operations and have the ability to perform strenuous tasks under difficult conditions. It is imperative that s/he have excellent visual acuity and color perception and be of good health and physical endurance. Lastly, the captain should have a pleasing personality and be able to get along well with people.

EARNINGS AND ADDITIONAL BENEFITS: The earnings of a sportfishing captain are dependent upon the experience of the captain and the employer who has hired him/her. Earnings may range from $150 to $1,400 per week.

Fringe benefits also vary according to the employer. Most captains working for private companies have hospitalization insurance, a plan for retirement, vacation with pay, annual sick leave, and some holidays off with pay.

WORKING CONDITIONS AND LIFESTYLES:

A sportfishing captain can expect to work many long hours while on duty. S/He is expected to be available to respond to emergencies any time of the 24-hour commitment while on a trip.

Some sportfishing vessels travel to other countries and may be gone from two weeks to six months depending upon the wishes of the employer.

Most of the larger fishing vessels have very comfortable living quarters; however, the employee may have to be absent from his/her home and/or family for extended periods of time. Also, the work is seasonal. During the off-season, captains may have to seek other employment, such as doing maintenance work on boats on a regular eight-hour basis and receive hourly wages.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

Sportfishing Captain	197.133-010
Master, Yacht	197.133-014
Mate, Ship	197.133-022
Tugboat Captain	197.133-030

OCCUPATIONAL TASK: Organizing a sportfishing trip

OCCUPATIONAL COMPETENCY: Planning meals and recreation for guests

RESOURCES and/or MATERIALS

1. Career Information Sheets
2. Activity Sheet A - Food Supply List
3. Activity Sheet B - Recreation on the Ship
4. Student Attitude Sheets

PEEP's Sportfishing Trips
MENU

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of the overall work associated with being a sportfishing captain.
2. Appreciate the need for an evenly tempered person to aspire to becoming a sportfishing captain.
3. Realize some advantages and disadvantages of working as a sportfishing captain.

LEARNING ACTIVITIES

1. Become familiar with the Career Information Sheet.
2. Complete Activity A.
   Divide the class into four groups and assign each group to plan one of the three meals and snack times for the group. (Breakfast, Lunch, Dinner, and Snack times.) Remember, fish will be caught and can be prepared on the ship as part of the food.)
3. Complete Activity B.
   Have each student to recommend one type of recreation that can be done on a 300-foot ship by a mixed-age group of people.
4. Divide the class into groups to discuss Part 2 of Activity B. Share the solutions to the unexpected circumstances encountered by the captain.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Becoming familiar with the Career Information Sheet.
2. Participating in a group situation to complete Activity A.
3. Submitting one type of recreation for the "Judy Queene" fishing trip and completing Activity B.
4. Completing the Student Attitude Sheet.

Activity A

FOOD SUPPLY LIST

As captain of the "Judy Queene," a three-hundred foot sportfishing vessel, you are responsible for planning and seeing that ten guests and your employer have a delightful time during a four-week voyage and fishing trip.

First, you must suggest a place where fishing and the weather are expected to be good from July 30 - August 30.

The guests include the following:

(a) 3 Men (ages 42, 48, 53)

(b) 3 Women (wives of 3 men. Ages 38, 42, and 50)

(c) 3 Teenagers (2 sons, ages 14 and 16, 1 daughter, age 15)

(d) 1 Baby (6 months old, bottle fed)

(e) Your employer (female, age 62)

In addition to the ten guests and your employer, there are five crew members including yourself for which you must plan.

Plan this trip carefully. Your boss wants to really impress the three business men and their wives. Much of her success next year will depend upon her business endeavors with these company representatives. Remember also, that the economy has been slower this year and her business has not realized a big profit.

Activity B

RECREATION ON THE SHIP

The trip has been planned especially for fishing during the day. However, your boss expects you as captain of the "Judy Queene" to be ready to respond to many unexpected circumstances. Perhaps you should have several things planned for this mixed-age group who is scheduled to be away from their home and on a ship for four weeks in which you are in charge. (1) Plan recreational activities for this group of people. (2) How will you respond to the following circumstances:

(a) Heavy rains for three days - Aug. 1, 2, 3.

(b) 15-year old daughter stays seasick July 31 - August 20.

(c) The 50-year old woman is an alcoholic and becomes overly intoxicated. She demands that a party begin at 12:00 p.m. on Saturday night.

(d) Small baby breaks out with the "mumps" August 25 and cries continuously.

As captain of the "Judy Queene," you will probably be happy when you get the group back to the U.S. safely, your boss gets contracts renewed, and you have your paycheck to spend in keeping your creditors happy.

Name ______________________________

Occupational Cluster Marine/Fresh Water - Sportfishing Captain

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much	Liked it	Didn't like it or didn't dislike it	Not very Interesting	Didn't enjoy any part of it
Reading Career Information Sheet					
Completing a Food Supply List for guests and crew					
Planning recreation for mixed-age group					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

CAREER INFORMATION SHEET

JOB TITLE: Tugboat Captain **DOT CODE:** 197.133-030

DUTIES:

A tugboat captain commands a tugboat to tow barges and ships into and out of harbors, estuaries, straits, and sounds, and on rivers, lakes, and bays.

S/He signals the workers on deck to rig towlines to barges or ship to be towed. It is her/his responsibility to determine the course and towing speed to be taken and used based on specialized knowledge of local winds, weather, tides, and current. S/He steers the tugboat to push or pull barges to destination and to berth and unberth ships, avoiding reefs, outlying shoals, and other hazards to shipping. The captain accomplishes this task successfully by utilizing navigation devices, such as radar, sonic depth finder, compass, sextant, and aids to navigation, such as lighthouses and buoys.

This employee directs placement of suction hose or siphon to pump water from hold of barge and signals workers to repair a leak.

WHERE EMPLOYED:

Towing companies who move barges using towboats hire tugboat captains as commander of their tugboats.

EMPLOYMENT OUTLOOK:

The employment outlook for tugboat captain is expected to be present very keen competition. Some job openings are expected to occur as a result of the need to replace experienced workers who retire, die, or change to another type of employment.

EDUCATION AND TRAINING: A high school education is recommended for aspirants to become a tugboat captain. A person must pass a qualifying examination and have experience working at lower ranks such as deckhand, watchman, mate, sternsman, pilot, and/or relief captain ir order to learn many necessary skills.

SPECIAL QUALIFICATIONS: A tugboat captain must be licensed by the U.S. Coast Guard before getting his/her pilot's license.

EARNINGS AND ADDITIONAL BENEFITS: The earnings and additional benefits for tugboat captains of water vessels vary according to employer. An expected range of salary is $25,000 to $50,000 annually depending upon amount of travel, experience of employee, and company policy of employer.

WORKING CONDITIONS AND LIFESTYLES: Usually, the captain of a tugboat can expect to have favorable working conditions. Most of the time, the living facilities aboard ship are comfortable with nutritious meals served to complement his/her stay on the ship.

Occasionally this worker is forced to work under adverse weather conditions which may prove to be uncomfortable. Also, tugboat captains have to work unusually long periods of time, such as 30 days on the job and then 30 days off. Consequently, tugboat captains may have to be away from home for extended periods of time and work longer shifts while on duty.

ENVIRONMENTAL OCCUPATIONS

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILY: Water Vehicle Operation

REPRESENTATIVE JOB TITLES:

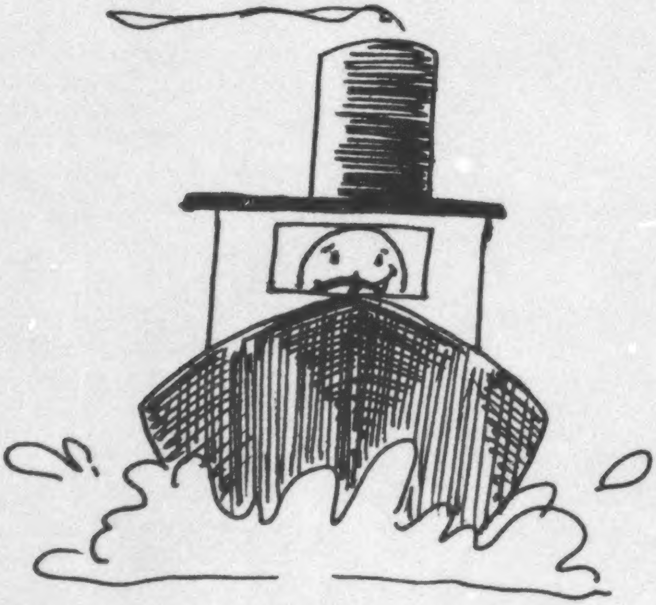
Tugboat Captain	197.133-030
Pilot, Ship	197.133-026
Dredge Mate	197.137-010
Tugboat Mate	197.133-034

OCCUPATIONAL TASK: Focusing on abilities

OCCUPATIONAL COMPETENCY: Comparing abilities needed by tugboat captain and ninth grade student

RESOURCES and/or MATERIALS

1. Career Information Sheet
2. Transparency: "ABILITIES NEEDED BY TUGBOAT CAPTAIN" (optional)



LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Become more knowledgeable of a tugboat captain's responsibilities.
2. Discuss advantages and disadvantages of working as a tugboat captain.
3. Appreciate persons who earn their livelihood commanding tugboats.
4. Determine if you are interested in learning more about a jeweler.

LEARNING ACTIVITIES

1. Read the Career Information Sheet.
2. Discuss several advantages and disadvantages of working as a tugboat captain.
3. Develop a list of abilities which are needed by a tugboat captain. (Use information printed on Career Information Sheet).
4. Develop a list of abilities which you have now and compare with the tugboat captain's.
5. Complete the Student Attitude Sheet.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Reading the Career Information Sheet.
2. Participation in class discussion.
3. Completing a list of abilities needed by a tugboat captain and a list of your abilities and comparing the two.
4. Completing the Student Attitude Sheet.

ABILITIES NEEDED BY TUGBOAT CAPTAIN

1. To communicate well with many people

2. To give proper signals to workers on deck

3. To hold up under pressure

4. To read charts and determine direction to be taken

5. To do basic and advanced math

6. To work with compass, sextant, and radar

7. To stay alert for extended periods of time

8. To exercise patience

9. To recall information

10. To spend extended periods of time away from family and friends

11. To be relaxed on a boat

12. To read, write, and speak well

Name ______________________________

Occupational Cluster Marine/Fresh Water - Tugboat Captain

STUDENT ATTITUDE SHEET

Please check the block which best describes your feeling toward the activities which you have just completed.

SKILLS OR ACTIVITIES	Enjoyed it very much 	Liked it 	Didn't like it or didn't dislike it 	Not very Interesting 	Didn't enjoy any part of it
Reading the Career Information Sheet					
Class discussion of advantages and disadvantages of being tugboat captain					
Developing lists of abilities of tugboat captain and student and comparing the two					

	YES	NO
Are you now aware of jobs using these skills or activities?		
Would you like a job involving these skills or activities?		
Would you like to find out more about this area of work?		

Comments ______________________________

____

____

ENVIRONMENTAL OCCUPATIONS
(Culminating Lesson)

OCCUPATIONAL CLUSTER: Marine/Fresh Water

OCCUPATIONAL FAMILIES:

and

REPRESENTATIVE JOB TITLES:

A. Fishery
   1. Commercial Fisherman
   2. Deckhand, Fishing Vessel
   3. Fish Hatchery Worker
   4. Live Bait Supplier

B. Life Sciences
   1. Fish Biologist

C. Marine Life Cultivation
   1. Aquarium Tank Attendant
   2. Fish Culturist

D. Research
   1. Hydrologist
   2. Oceanographer, Physical
   3. Surveyor, Marine

E. Water Vehicle Operation
   1. Lock Operator
   2. Marina Worker
   3. Mate, Ship
   4. Motorboat Mechanic
   5. Sportfishing Captain

OCCUPATIONAL TASK: Reviewing occupations in the marine/fresh water cluster

OCCUPATIONAL COMPETENCY: Relating personal interests, skills, and abilities to selected occupations

RESOURCES and/or MATERIALS

Activity Sheet A

LEARNING OBJECTIVES

After completing the learning activities, you should be able to:

1. Realize more completely whether your personal interests, skills, and abilities can be applied in marine/fresh water occupations.
2. Relate your favored school subjects and/or hobbies to marine/fresh water occupations.
3. Determine if a career in marine/fresh water is for you.

LEARNING ACTIVITIES

1. Make a list of your favorite school subjects and hobbies.
2. Identify your personal interests, skills, and abilities that you feel make these school subjects and hobbies enjoyable.
3. List some marine/fresh water occupations that interest you.
4. Complete Activity Sheet A.

EVALUATION PROCEDURES

Your evaluation will consist of:

1. Completing a list of favorite school subjects and hobbies.
2. Compiling a list of personal interests, skills, and abilities.
3. Selecting marine/fresh water occupations that interest you.
4. Completing and submitting to the teacher Activity Sheet A.

Activity Sheet A

Read each statement carefully. Respond to each of the following statements by placing YES or NO in the space provided.

_____ 1. I am strong and love the outdoors.

_____ 2. I am healthy and prefer to stay indoors.

_____ 3. I like to be around water.

_____ 4. I enjoy working alone or with others.

_____ 5. I prefer to give directions rather than follow them.

_____ 6. I like working with my hands.

_____ 7. I enjoy performing routine work.

_____ 8. I like animals and other living things.

_____ 9. I like to work when there is a real challenge.

_____10. I like to work with mechanical and electronic equipment.

_____11. I enjoy putting things together.

_____12. I like to take things apart.

_____13. I like to get into dirt and grime of heavy work.

_____14. I like the cleanliness of precision work.

_____15. I like work that makes me feel important.

_____16. I like frequent change and varied duties.

_____17. I don't mind heat, cold, temperature change.

_____18. I would be willing to train for two to four years.

_____19. I can arrange, explain, and use facts.

_____20. I can use my eyes in work.

How many statements could you answer YES? _____

How many statements did you respond with NO? _____

If your score of YES exceeds the number of NO, you just may be happy in an occupation found in marine/fresh water.